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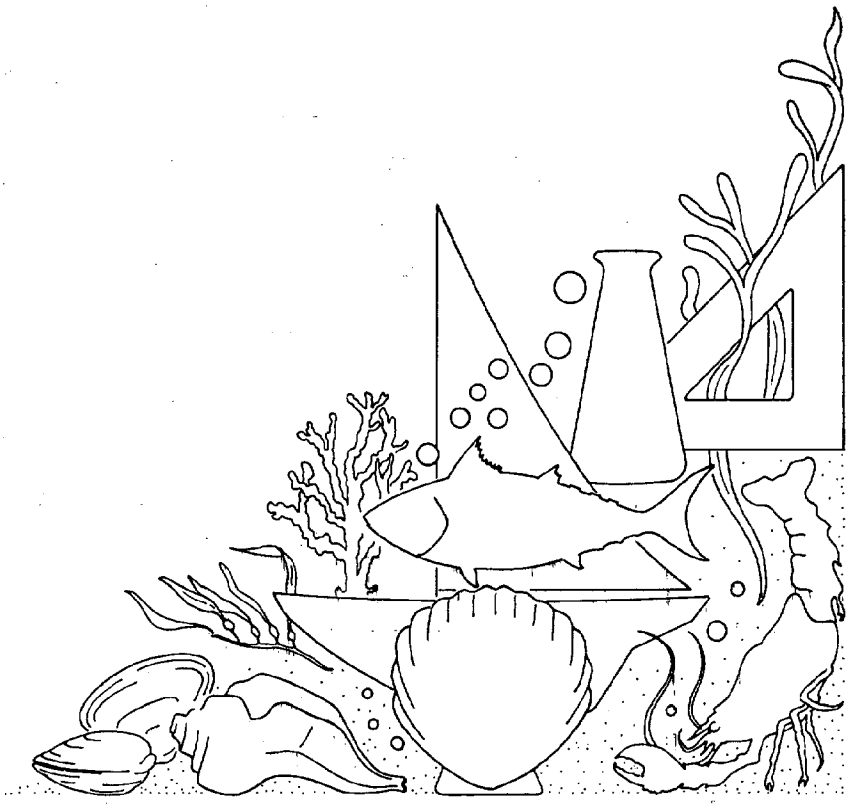

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NA SUFFOLK REGIONAL PLANNING BOARD

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DR. CLARKE WILLIAMS

00619

Foreword

The full report of the Committee is composed of four parts: Summary; Facts, Opinions and Conclusions; Supporting Data; and Appendices.

The Summary is a distillation of the other three sections and is presented in this abbreviated report to afford a capsule view of the Committee's efforts.

SECTION A — Organization & Procedures

1. Creation of Committee

a. On April 26, 1965 the Nassau-Suffolk Regional Planning Board determined that an Oceanographic Committee should be formed to study the opportunities and problems growing out of the impact of the population expansion on the marine environment of Nassau and Suffolk Counties.

b. On June 30, 1965 the Nassau-Suffolk Regional Planning Board announced the creation of the Committee. The committee membership was selected to ensure broad representation of industry, finance, education, research and regional planning.

c. On September 9, 1965 the Committee met with members of the Regional Planning Board for an informal discussion of the Committee's general responsibilities.

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a. At the first formal meeting of the Committee on September 15, 1965 it was agreed the following broad objectives would be established to guide the Committee in the conduct of its business.

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b. In the conduct of the business of the Committee a total of 41 meetings were held either in the Nassau or Suffolk County Planning Department offices.

c. Forty-four witnesses appeared before the Committee to discuss matters of interest to the Committee.

d. In addition to testimony received orally from witnesses the Committee received 12 papers from interested individuals or organizations.

e. The Committee individually and collectively considered books, reports, etc. relevant to the business of the Committee.

f. On October 12, 1966 the Committee having heard all witnesses terminated formal hearing sessions and commenced the preparation of the report.

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3. *Effort Summary*

a. The attendance at the Committee meetings has been excellent. The meetings, hearings and visits or inspections which have been of 3-5 hour duration represent over 740 man-hours. The number of man-hours devoted to background reading and preparation of special reports by members of the Committee and in preparation of the continuing record and final report exceed the man-hours of attendance at formal meetings by a factor of four to one.

4. *Report*

a. No distribution of the report has been made except to the Nassau-Suffolk Regional Planning Board and no press or other release or interviews have been made, nor will they be made except as approved by the Regional Planning Board.

SECTION B — Discussion

1. *Background*

1. At the start of the activities of the Oceanographic Committee it appeared that there were two separate areas of interest. These were:

a. Examination of the opportunities on Long Island to participate in the growing national oceanographic and ocean engineering programs of this country.

b. Examination of the oceanographic problems growing out of the effects of population expansion on Long Island's marine environment.

2. As the work of the Committee progressed, it became evident that the two areas of interest were inseparable, and may be expressed as follows:

Examination of Long Island's oceanographic problems and the action required to preserve a favorable marine environment, and the opportunities such action will present for Long Island to become a center of oceanographic activities and a major participant in the growing national oceanographic and ocean engineering program.

3. Three factors of overriding importance to the development and growth of Long Island are:

a. The long narrow shape of Long Island (120 miles long, 20 miles maximum width).

b. The proximity of Nassau and Suffolk Counties to the super metropolis of Greater New York City.

c. The complex marine environment of Long Island with its extreme sensitivity to the effects of population expansion.

4. Long Island's shape and its proximity to New York City are unalterable, but the complex marine environment of Long Island is all too alterable. Population expansion on the Island has caused serious deterioration to the once delightful marine environment which has been a major contributing factor in the Island's attractiveness and consequential growth.

5. A favorable marine environment is one which in its totality serves the best interests of the entire community.

6. Today 11 Long Island beaches are closed to bathing due to pollution; over 10,000 acres of its shellfish areas are closed for the same reason.

7. Approximately 25% of the wetlands, an essential feature of Long Island's marine environment, has been destroyed.

2. *Pollution*

1. The most serious source of pollution of the marine environment is the inadequacy of Long Island sewage systems. The most dangerous effect is the seepage of human, household and industrial wastes to the fresh water resources that underlie the Island. This problem is receiving close attention and undoubtedly a more adequate sewage system will result. It is very important to the marine environment that there be improved sewage systems particularly close to the shore where direct discharge and seepage

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2. Another source of contamination of the marine environment is the storm runoff of insecticides, herbicides and fertilizers through storm drains and rivers. This is a complex problem which is being attacked on one front by elimination of DDT in mosquito control.

3. There is serious pollution of the marine environment by duck wastes resulting from the use of Long Island rivers by duck farmers as watering places for their ducks.

4. Another source of pollution is the growing number of boats and marinas. It is estimated that there are at least 175,000 boats of all sorts operating in Long Island waters. Regardless of how picturesque and pleasant Long Island boating may be, the fact remains that when these boats place raw or chemically treated sewage into a marine environment, they become a great source of pollution.

3. *Economics*

1. There are a number of important industries on Long Island that are directly related to the marine environment. These include shell fisheries commercial and sport fishing, boating, bathing and almost the entire tourist business. Generally, each of these businesses, is enhanced by any improvement of the marine environment. None of these businesses damage the environment except when their boats or facilities discharge pollutants into the shore waters.

2. The duck industry definitely damages the marine environment in its current practice of dumping duck wastes into waters adjacent to its operations.

3. The dredging industry enhances the marine environment when it improves water circulation and navigation, but it is harmful when it removes productive bottoms and fills wetlands.

4. The large residential real estate business of Long Island has, in the past, and will continue to be favorably affected by maintenance of an attractive marine environment. The great value of shore properties and the marine-associated advantages of Long Island, as highlighted in publicity material, are illustrative of the close connection between expanded real estate business and the attractive marine environment.

5. Non-marine related industrial development is enhanced by attractive surroundings for employees of all levels. A unique advantage of Long Island in attracting new industries is the pleasant atmosphere of Long Island living which is intimately associated with the marine environment. If this environment is allowed to become unattractive, industrial as well as residential expansion of Long Island will be adversely affected.

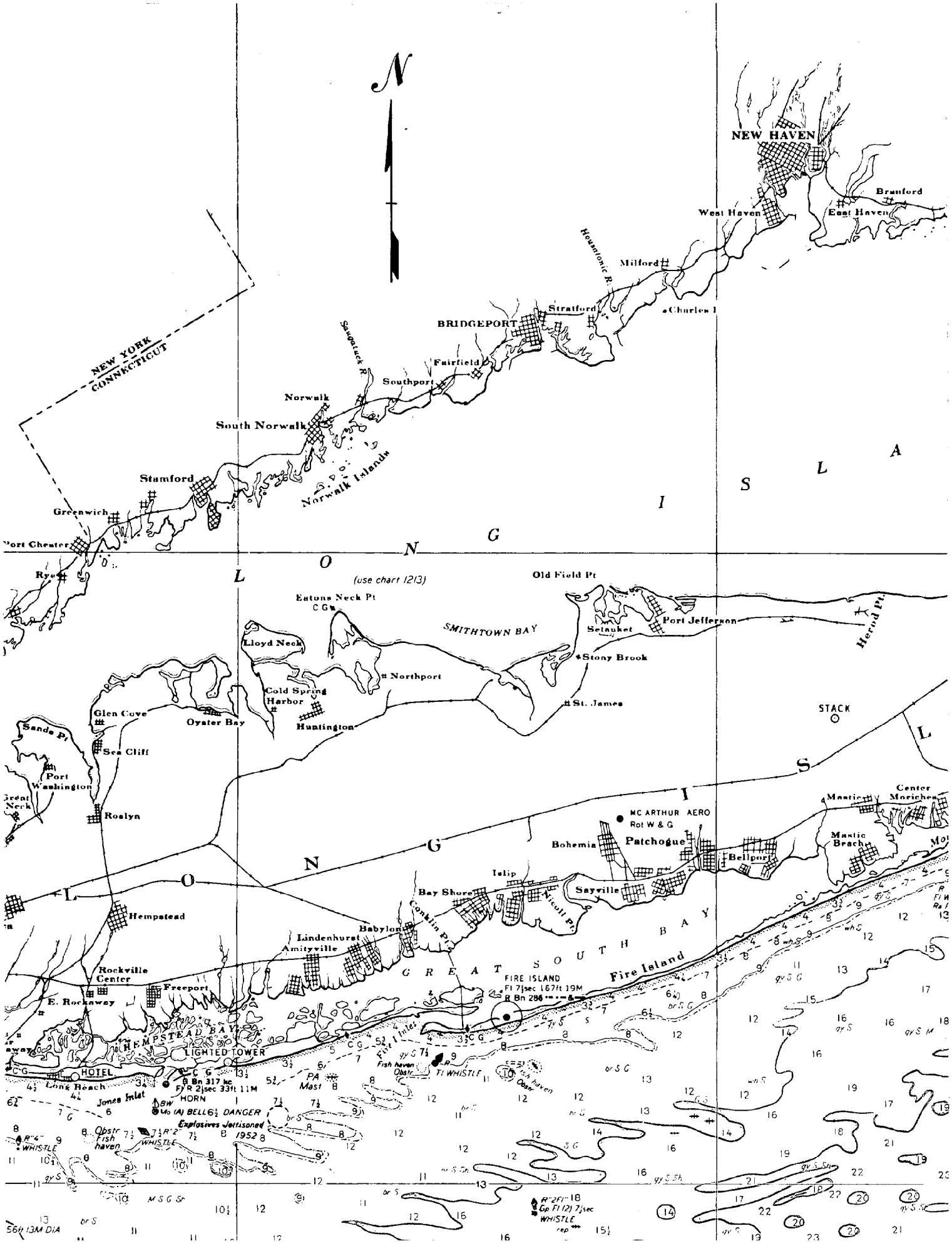
6. The attractive marine environment of Long Island is an asset which cannot be taken for granted. There are growing numbers of examples where this asset has deteriorated into an unattractive liability. This deterioration should alert all Long Islanders against indifference to the condition of the marine environment.

7. Unless Long Island now, and on a continuing basis, plans and executes programs to maintain the attractiveness of the marine environment it will continue to degenerate and become a deterrent to Long Island's growth.

4. *Research*

1. Long Island's most challenging problem is to carry out a research program that will generate the knowledge necessary to manage its own marine environment in the face of population expansion. Long Island's best opportunity for preeminence in the expanding of oceanography lies in acquisition of the knowledge required to solve its own problems.

2. Long Island has one of the world's most pressing requirements for knowledge of the effects of population expansion on the marine environment. However, there are many places around the world with marine environments similar to Long Island's that now or will have in the future a requirement to understand the interaction between their population growth and their marine environment. Long Island's understanding of its problems will be applicable to many other areas here in the U.S. and abroad. If Long Island develops a strong capability in the understanding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Saugatuck R.
Fairfield
Southport
Norwalk
South Norwalk
Norwalk Islands
Stamford
Greenwich
Port Chester
NEW YORK
CONNECTICUT
Rye
LONG ISLAND
(use chart 1213)
Old Field Pt
Eatons Neck Pt
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SMITHTOWN BAY
Setauket
Port Jefferson
Herod Pt.
Lloyd Neck
Stony Brook
Northport
Cold Spring Harbor
St. James
Glen Cove
Oyster Bay
Huntington
Sands Pt
Sea Cliff
Port Washington
Great Neck
Roslyn
STACK
Center Moriches
Mastic
Mastic Beach
MC ARTHUR AERO
Rot W & G
Bohemia
Patchogue
Bellport
Islip
Bay Shore
Sayville
Tiicoll Pt.
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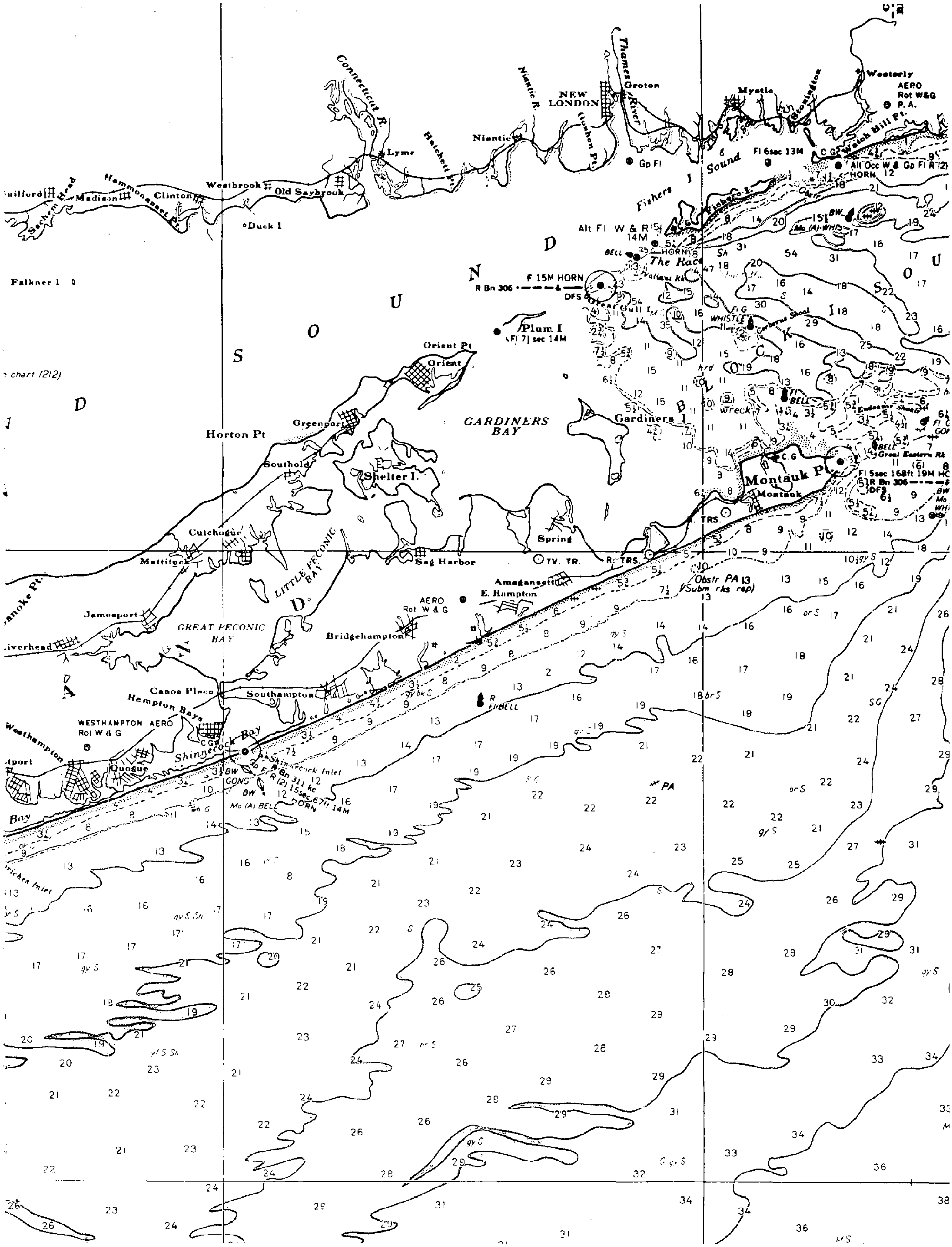
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Madison
Hammonasset Pt.
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The Race
Great Gull I.
Plum I
Orient Pt
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Greenport
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Southold
Shelter I.
GARDINERS BAY
Gardiners I
Cerberus Shoal
Montauk Pt.
Montauk
Great Eastern Rk
Cutchogue
Mattituck
Sag Harbor
Spring
TV. TR.
Amagansett
E. Hampton
LITTLE PECONIC BAY
GREAT PECONIC BAY
Jamesport
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Bridgehampton
Canoe Place
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and solution of its own problems it will be well in its way towards being the world center of such research.

3. Extensive research programs will be required before we adequately understand the various contaminants from human, household, industrial, pesticidal, herbicidal or agricultural wastes: how these contaminants reach the marine environment; their effects on the biology and chemistry of the environment; and their flushing by the physical oceanography of the off-shore waters.

4. The acquisition of this knowledge by Long Island requires a strong research program. This research program will have to define the data to be collected, and when and where it is to be collected. It will also have to provide for data interpretation to generate knowlegde in sufficient detail to support effective planning. While it may be started on a pilot basis, it will certainly grow into a large and expensive program.

5. If Long Island demonstrates a determination to correct the obvious degradation of the marine environment, and to conduct a research program including the problems of Sound, bays, estuaries, it is believed that substantial financial support can be expected from Federal, State or Foundational sources. Emphasis of such financial support has documentation in the recent report of the President's Scientific Advisory Committee, *Effective Use of the Sea.*

6. Almost all of the data collection necessary to the acquisition of an understanding of the effects of population growth on Long Island's marine environment must be done on the Island itself and in its adjacent waters. Furthermore, it will be expedient if data interpretation is also done on the Island close to the scene of the data collection. Consequently, Long Island's research into its own problems should be accompanied by a growth of industry related to data collection, recording and interpretation.

7. A fundamental requirement is for Long Island to establish a research program, that includes the necessary data collection and data interpretation, that will generate, first on a pilot program but later on an expanded program, the understanding necessary to support effective planning for protection of Long Island's marine environment against the deterioration associated with expanded population.

5. *Education*

1. Closely associated with the urgent necessity for strong research programs in peculiar problems of Long Island is the growing interest of Long Island universities, colleges and institutes in oceanography and ocean engineering.

2. There are 14 universities and colleges and Nassau and Suffolk Counties which offer some general courses in marine science and ocean engineering. As a rule, these courses are not specifically oriented to Long Island's marine environment. An educational capability oriented towards an understanding of the local marine environment can be strenghtened if:

a. The universities cooperate in the assembly of staff, facilities and a central library.

b. The universities concentrate on the study of the significant problems that face Long Island and do not diffuse their efforts in the study of deep or geographically remote ocean problems.

3. With this approach they should become the major contributor to the knowledge required to solve estuarine environmental problems.

4. The universities should receive all practical encouragement to combine their strength and concentrate on Long Island problems. If they do this, they should receive as much support in the form of assignment of responsibility in the Long Island research program as their capabilities and costs will permit.

6. *National Marine Laboratory*

1. At the present time, there is only one proposal put forth by any agency of the federal government for the immediate creation of a marine-oriented facility on the East Coast.

2. The Environmental Science Service Administration plans to establish a joint facility for the U.S. Coast and Geodetic Survey and the Institute of Oceanography on the East Coast. The facility would provide for a marine research laboratory employing 70 technicians and scientists. It would also provide berthing and a base for ocean ves-

sels of the Coast and Geodetic Survey which have a combined complement of 200 men.

3. Four sites on Long Island, as well as many others on the East Coast, meet the site selection criteria established by E.S.S.A.

4. The research carried out at this facility would not be aimed towards the solution of Long Island marine problems.

5. The importance of the location of the E.S.S.A. facility on Long Island has been locally overemphasized.

6. The major emphasis of Long Island's effort should be aimed at developing research facilities that focus on Long Island problems.

7. Administration

1. The results of this study indicate the need for the establishment of a marine resources council with the purpose of coordinating a continuous regional approach to the management and enhancement of the marine environment of Long Island including:

a. The formulation of a comprehensive plan for the management of the marine environment.

b. The resolution of conflicting issues affecting the marine environment.

c. The initiation of a coordinated university approach to the study of the marine sciences and ocean engineering.

d. The initiation of industrial participation in the research and development pertinent to the Long Island marine environment.

e. The initiation of a research program into the problems and potential of the marine environment.

2. The following set of procedures is suggested as a logical sequence of activities in carrying out such a research program.

a. Define the scope of the research program.

b. Translate into research language and program.

c. Establish priorities to initiate pilot program.

d. Put in proposal form.

e. Solicit proposals for pilot program.

f. Secure funds and award contract.

g. Monitor contract.

h. Analyze results and redefine the research effort.

i. Repeat steps b-h for expanded program.

3. The Oceanoographic Committee has fulfilled its responsibilities as mandated by the Nassau-Suffolk Regional Planning Board with the publication of this report.

SECTION C — Consolidated Action Recommendations

The recommendations fit into the following categories — administrative, regulatory, operational and promotional. All actions of an advisory or promotional nature pertaining to the planning of Nassau and Suffolk Counties are properly within the province of the Nassau-Suffolk Regional Planning Board. Recommendations of a regulatory or operational nature, must be acted upon by other agencies or levels of government. This does not preclude the initiation or support of such action by the Board, nor does this preclude the enlargement of the administrative functions of the Board to include such activities.

1. Administrative

a. Dissolve the Oceanographic Committee.

b. Establish the Regional Marine Resources Council.

c. Initiate the research program.

2. Regulatory

a. Stop duck farm pollution.

b. Stop raw sewage discharge and seepage into the marine environment from boats, marinas and land based facilities of any sort.

c. Prohibit marine sand and gravel mining except where it is a by-product of desirable activities as determined by the Regional Marine Resources Council.

d. Manage the existing wetlands in light of recommendations of the Regional Marine Resources Council.

e. Standardize leasing procedures for shellfish farms.

f. Control use of pesticides, insecticides, herbicides and fertilizers.

3. Operational

a. Dredge and stabilize Moriches Inlet.

4. Promotional

a. Encourage the appreciation on the part of Long Island citizens of the importance of the marine environment.

b. Encourage the establishment of adequate sewerage systems.

c. Encourage university coordination to specialize in local marine problems.

d. Encourage marine-oriented industries on Long Island.

e. Encourage the establishment of research facilities — national, state, local, foundational and industrial — that will focus on Long Island marine problems.

The Nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased and not impaired in value.

PRESIDENT THEODORE ROOSEVELT

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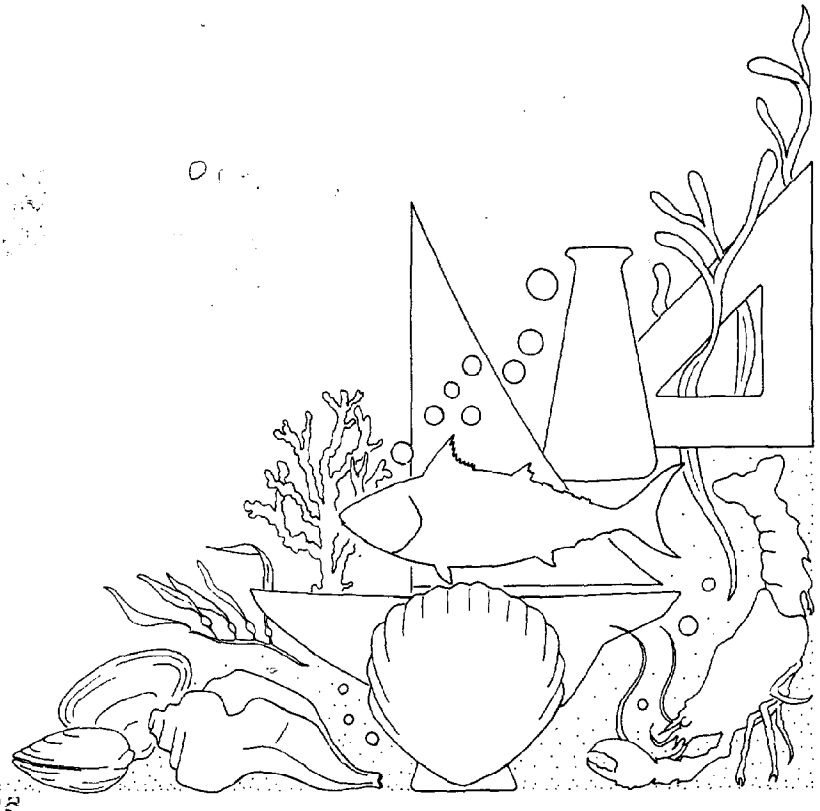

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NAS SUFFOLK REGIONAL PLANNING BOARD

00620

Nassau-Suffolk Regional Planning Board

Veterans Memorial Highway Hauppauge, L. I., N.Y. 11787
Area Code (516) 724-1919

December 7, 1966

Hon. Leonard W. Hall
Chairman, Nassau-Suffolk Regional Planning Board
Hauppauge, New York

Dear Mr. Hall:

Re: Report of the Oceanographic Committee

The signed original and 15 copies of the subject report are forwarded herewith.

As chairman of the committee it is my pleasure to acknowledge with great appreciation the tremendous contributions made by all members of the committee. Their high level of attendance and their continuing interest and initiative have been vital to the success of the committee.

On behalf of the committee it is my pleasure to applaud the interest and the efforts of the many public spirited citizens from management, industry, scientific and academic fields who have furnished invaluable information both verbal and written to the committee.

The committee now awaits the pleasure of the Regional Planning Board.

On behalf of the Oceanographic Committee,

E. C. Stephan
Rear Admiral, USN (Ret.)

REPORT on:

Long Island Marine Resources and their Relations to Industry, Conservation, Research and Education

OCEANOGRAPHIC COMMITTEE
of the
NASSAU-SUFFOLK REGIONAL PLANNING BOARD
December 1966

NASSAU-SUFFOLK REGIONAL PLANNING BOARD

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ACKNOWLEDGEMENTS

It has been a personal privilege and pleasure to be associated with my fellow committeemen, with the Regional Planning Board and with the fine citizens of Long Island who have helped us in our efforts. I wish to particularly express appreciation for the outstanding contributions the Committee received from Mr. Lee Koppelman - the Executive Director of the Committee, in the general staff work and preparation of the report and Mr. Richard Gardner and Mr. Norman Hicks of the Nassau and Suffolk County Planning Departments for their dedicated service.

E. C. Stephan

I find the great thing in this world is not so much where we stand, as in what direction we are moving. To reach the Port of Heaven, we must sail sometimes with the wind and sometimes against it, - but we must sail, and not drift, nor lie at anchor.

Oliver Wendell Holmes

Table of Contents

PREFACE - ORGANIZATION OF REPORT

The report is written in four parts:

I Summary Report
II Facts, Opinions and Conclusions in Areas of Marine Concern
III Supporting Data
IV Appendices

The Summary Report includes sections on Organization, Discussion and Consolidated Action Recommendations.

The Facts, Opinions and Conclusions part is based on the hearings and research of the Committee.

The Supporting Data part contains background data developed during the hearings.

The Appendices contain details referenced in the report.

This report is annotated between Parts as follows:

Part I, Section B to Part I, Section C and Part II.
Part I, Section C to Part II.
Part II to Part III.

Annotations can be found in the margin to the left of the body of the report.

The report has been arranged in this manner to facilitate perusal to whatever depth the individual reader desires.

PART I
SUMMARY REPORT

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2-2,3c
2-6,7

a. There are a number of important industries on Long Island that are directly related to the marine environment. These include shell fisheries, commercial and sport fishing, boating, bathing and almost the entire tourist business. Generally, each of these businesses is enhanced by any improvement of the marine environment. None of these businesses damage the environment except when their boats or facilities discharge pollutants into the shore waters.

P. 1-6,2a
2-2,3c
2-9

b. The duck industry definitely damages the marine environment in its current practice of dumping duck wastes into waters adjacent to its operations.

P. 1-6,2c
2-10

c. The dredging industry enhances the marine environment when it improves water circulation and navigation, but it is harmful when it removes productive bottoms and fills wetlands.

P. 2-12

d. The large residential real estate business of Long Island has, in the past, and will continue to be favorably affected by maintenance of an attractive marine environment. The great value of shore properties and the marine-associated advantages of Long Island, as highlighted in publicity material, are illustrative of the close connection between expanded real estate business and the attractive marine environment.

P. 1-6,4a

e. Non-marine related industrial development is enhanced by attractive surroundings for employees of all levels. A unique advantage of Long Island in attracting new industries is the pleasant atmosphere of Long Island living which is intimately associated with the marine environment. If this environment is allowed to become unattractive, industrial as well as residential expansion of Long Island will be adversely affected.

P. 1-6,4a
2-2

f. The attractive marine environment of Long Island is an asset which cannot be taken for granted. There are growing numbers of examples where this asset has deteriorated into an unattractive liability. This deterioration should alert all Long Islanders against indifference to the condition of the marine environment.

P. 1-6,1b
2-1,1

g. Unless Long Island now, and on a continuing basis, plans and executes programs to maintain the attractiveness of the marine environment, it will continue to degenerate and become a deterrent to Long Island's growth.

4. *Research*

P. 1-12,1c
2-4,5

a. Long Island's most challenging problem is to carry out a research program that will generate the knowledge necessary to manage its own marine environment in the face of population expansion. Long Island's best opportunity for preeminence in the expanding of oceanography lies in acquisition of the knowledge required to solve its own problems.

P. 2-4,5 b. Long Island has one of the world's most pressing requirements for knowledge of the effects of population expansion on the marine environment. However, there are many places around the world with marine environments similar to Long Island's that now or will have in the future a requirement to understand the interaction between their population growth and their marine environment. Long Island's understanding of its problems will be applicable to many other areas here in the United States and abroad. If Long Island develops a strong capability in the understanding and solution of its own problems it will be well on its way towards being the world center of such research.

P. 2-4,4 c. Extensive research programs will be required before we adequately understand the various contaminants from human, household, industrial, pesticidal, herbicidal or agricultural wastes: how these contaminants reach the marine environment; their effects on the biology and chemistry of the environment; and their flushing by the physical oceanography of the off-shore waters.

P. 2-4,4 d. The acquisition of this knowledge by Long Island requires a strong research program. This research program will have to define the data to be collected, and when and where it is to be collected. It will also have to provide for data interpretation to generate knowledge in sufficient detail to support effective planning. While it may be started on a pilot basis, it will certainly grow into a large and expensive program.

P. 2-5,5 e. If Long Island demonstrates a determination to correct the obvious degradation of the marine environment, and to conduct a research program including the problems of Sound, bays, estuaries, it is believed that substantial financial support can be expected from Federal, State, or Foundational sources. Emphasis of such financial support has documentation in the recent report of the President's Scientific Advisory Committee, *Effective Use of the Sea.*

P. 2-4,4 f. Almost all of the data collection necessary to the acquisition of an understanding of the effects of population growth on Long Island's marine environment must be done on the Island itself and in its adjacent waters. Furthermore, it will be expedient if data interpretation is also done on the Island close to the scene of the data collection. Consequently, Long Island's research into its own problems should be accompanied by a growth of industry related to data collection, recording and interpretation.

5. Education

P. 2-4,4 a. Closely associated with the urgent necessity for strong research programs in the peculiar problems of Long Island is the growing interest of Long Island universities, colleges and institutes in oceanography and ocean engineering.

P. 2-4,4 b. There are 14 universities and colleges in Nassau and Suffolk Counties which offer some general courses in marine science and ocean engineering. As a rule, these courses are not specifically oriented to Long Island's marine environment. An educational capability oriented towards an understanding of the local marine environment can be strengthened if:

1. The universities cooperate in the assembly of staff, facilities and a central library.
2. The universities concentrate on the study of the significant problems that face Long Island and do not diffuse their efforts in the study of deep or geographically remote ocean problems.

P. 2-4,4 c. With this approach they should become the major contributor to the knowledge required to solve estuarine environmental problems.

P. 1-6,4c d. The universities should receive all practical encouragement to combine their strength and concentrate on Long Island's problems. If they do this, they should receive as much support in the form of assignment of responsibility in the Long Island research program as their capabilities and costs will permit.

6. National Marine Laboratory

P. 2-5,6 a. At the present time, there is only one proposal put forth by any agency of the federal government for the immediate creation of a marine-oriented facility on the east coast.

P. 2-5,6 b. E.S.S.A. plans to establish a joint facility for the Institute of Oceanography and the Coast and Geodetic Survey on the east coast. The facility would provide for a marine research laboratory employing 70 technicians and scientists. It would also provide berthing and a base for ocean vessels of the Coast and Geodetic Survey.

P. 2-5,6 c. There are at least 4 locations in Nassau and Suffolk which meet all or most of the site selection criteria.

7. Administration

P. 1-6,1b, 2-1,1 a. The results of this study indicate the need for the establishment of a marine resources council with the purpose of coordinating a continuous regional approach to the management and enhancement of the marine environment of Long Island including:

1. The formulation of a comprehensive plan for the management of the marine environment.
2. The resolution of conflicting issues affecting the marine environment.

P. 1-6,4c 3. The initiation of a coordinated university approach to the study of the marine sciences and ocean engineering.

P. 2-5,5 4. The initiation of industrial participation in the research and development pertinent to the Long Island marine environment.

P. 1-6,1c 5. The initiation of a research program into the problems and potential of the marine environment.

b. The following set of procedures is suggested as a logical sequence of activities in carrying out such a research program:

1. Define the scope of the research program.
2. Translate into research language and program.
3. Establish priorities to initiate pilot program.
4. Put in proposal form.
5. Solicit proposals for pilot program.
6. Secure funds and award contract.
7. Monitor contract.
8. Analyze results and redefine the research effort.
9. Repeat steps 2-8 for expanded program.

P. 1-6,1a c. The Oceanographic Committee has fulfilled its responsibilities as mandated by the Nassau-Suffolk Regional Planning Board with the publication of this report.

SECTION C — Consolidated Action Recommendations

The recommendations fit into the following categories -- administrative, regulatory, operational and promotional. All actions of an advisory or promotional nature pertaining to the planning of Nassau and Suffolk Counties are properly within the province of the Nassau-Suffolk Regional Planning Board. Recommendations of a regulatory or operational nature, must be acted upon by other agencies or levels of government. This does not preclude the initiation or support of such action by the Board, nor does this preclude the enlargement of the administrative functions of the Board to include such activities.

1. Administrative

P. 2-1,1	a. Dissolve the Oceanographic Committee.
	b. Establish the Regional Marine Resources Council.
	c. Initiate the research program.

2. Regulatory

P. 2-2,3 2-9	a. Stop duck farm pollution.
P. 2-2,3	b. Stop raw sewage discharge and seepage into the marine environment from boats, marinas and land based facilities of any sort.
P. 2-10 2-11	c. Prohibit marine sand and gravel mining except where it is a by-product of desirable activities as determined by the Regional Marine Resources Council.
P. 2-2,2	d. Manage the existing wetlands in light of recommendations of the Regional Marine Resources Council.
P. 2-7 2-8	e. Standardize leasing procedures for shellfish farms.
P. 2-2,3	f. Control use of pesticides, insecticides, herbicides, and fertilizers.

3. Operational

P. 2-8 2-10	a. Dredge and stabilize Moriches Inlet.

4. Promotional

	a. Encourage the appreciation on the part of Long Island citizens of the importance of the marine environment.
P. 2-2,3	b. Encourage the establishment of adequate sewerage systems.
P. 2-4,4	c. Encourage university coordination to specialize in local problems.
P. 2-5,5	d. Encourage marine-oriented industries on Long Island.

PART II
FACTS, OPINIONS AND CONCLUSIONS IN AREA OF MARINE CONCERN

PART II:
Facts, Opinions and Conclusions

In the course of its deliberations, it was expedient for the Committee to examine the various areas of interest in terms of the facts, opinions and conclusions within these areas.

This section is annotated to Part III: Supporting Data. The order of treatment of the various areas of interest in the section does not connote any qualitative preference.

1. Governmental

FACTS

P. 3-39 a. Nassau and Suffolk Counties are comprised of 13 towns, 92 villages and 2 cities.

P. 3-39 b. Each municipality controls its own destiny in matters of planning and zoning for land use.

P. 3-39 c. The marine environment is controlled in some measure by each municipality in which the waters are located, as well as by the county, state and federal governments.

P. 3-39 d. There is no systematic coordination among the various municipalities relative to the marine environment.

P. 3-39 e. Resolution of problems of the marine environment created by one municipality that affect other governments have no regular means of solution, other than through the courts.

P. 3-39 f. No effective program exists to understand or solve the mutual problems affecting the total marine environment.

P. 3-39 g. Effective coordination by the various federal agencies that exert control or influence over the marine environment of Long Island is lacking.

OPINIONS

P. 3-39 a. Coordination is necessary among all the entities of government -- local, state and federal -- to protect, improve and enhance the marine environment.

CONCLUSIONS

P. 3-43 a. An overall authority is necessary for the management of the marine environment.

P. 3-45 b. This authority, respecting local needs and desires, should be initiated by Nassau and Suffolk Counties, not at the state or federal level.

P. 3-46 c. Such an authority should contain an executive committee of 8-10 members, representing the areas of conservation, health, marine industry, marine research, non-marine industry, education, real estate, government, recreation, and possibly others.

2. *Conservation*

FACTS

P. 3-29 a. Unpolluted waters are essential to shellfish production.

P. 3-5 b. Wetlands are the spawning and feeding grounds for shellfish, finfish, waterfowl and many other forms of life, each dependent upon the others as part of the food-chain.

P. 3-30 c. Duck farm wastes, entering the creeks, rivers and bays have created a nutrient imbalance that has proven harmful to shellfish production.

P. 3-6 d. The salt marshes, barrier beaches and wetland flora provide the mainland with a buffer against storm surges and cases of unusually high tides.

P. 3-6
3-12 e. Valuable wetlands are lost due to dredging, landfill operations and pollution.

OPINIONS

P. 3-27 a. The protection of the Long Island natural marine environment is of direct benefit to the people of Long Island.

P. 3-27 b. The quality of living on Long Island is adversely affected by the diminution of conservation values.

P. 3-6 c. The loss of the wetlands would result in the loss of shellfish and finfish.

P. 3-38 d. The overall financial yield of the productive wetland and shellfish areas can be greater than that of real estate or sand and gravel mining of these same areas.

CONCLUSIONS

P. 3-12 to
3-16
P. 3-10 a. Pollutants should not be allowed to enter the marine environment.

b. The major wetland areas should be conserved.

3. *Pollution Control*

FACTS

P. 3-12 a. The problem of the contamination of the fresh water table under Long Island by human wastes, or by industrial or agricultural waste, is receiving attention by others.

P. 3-2 b. The contamination of the Long Island marine environment from any source is the concern of the oceanographic committee.

c. At the present time the marine environment is being contaminated by:

P. 3-12 1. Outlets that run off raw sewage into the marine environment.

P. 3-12 2. Direct seepage of sewage from cisterns or cesspools into the marine environment.

P. 3-12 3. Discharge of inadequately treated sewage into the marine environment.

P. 3-13 4. Discharge of duck farm wastes into the creeks, rivers and bays.

P. 3-13 5. Discharge of raw sewage or inadequately treated sewage or other contaminants from boats or marinas.

P. 3-13 6. Runoff of detrimental pesticides, insecticides, herbicides, fertilizers and other chemicals.

d. As a result of pollution of the marine environment from one or more of the sources listed in c above, the following steps have been taken by New York State or County authorities in Nassau and Suffolk.

P. 3-12 1. Eleven beaches have been closed or refused permits for public bathing.

P. 3-30 2. More than 10,000 acres have been closed to shellfishing.

P. 3-34 3. A pilot project is underway to control some aspects of duck pollution.

P. 3-14 4. The Mosquito Control Commissions have suspended use of DDT in wetland areas.

P. 3-13 5. Suffolk County is in the process of establishing a Sewer Authority.

P. 3-13 6. Nassau County is in the process of establishing its third sewer district.

P. 3-7 e. Contamination of some bays and harbors has been reduced by dredging operations to improve flushing or to actually remove settled pollutants.

P. 3-22 f. The cause-effects relationship between pollutants of all types and the well-being of the marine environment is not presently well understood.

OPINIONS

P. 3-22 a. The need for adequate knowledge on which Long Island planners can recommend steps to preserve a healthy marine environment is critical.

CONCLUSIONS

P. 3-22 a. A research program must be inaugurated to increase the understanding of Long Island pollution, sources of pollutants, the effect of pollution upon the marine environment, the means of avoiding pollution and of the corrective action to repair the damages of pollution.

P. 3-12 b. Sewerage programs aimed at protection of the Long Island fresh water resources are beneficial to the marine environment. However, proper precautions must be taken as to the type of effluent drained into the marine environment and the locations of such drainage.

P. 3-12 c. Particular attention must be given to the need for sewerage systems on waterfront property where direct seepage to the marine environment is to be expected.

P. 3-12
3-13 d. Duck farm pollution of creeks, rivers and bays must be stopped.

P. 3-43 e. Regulations governing the discharge of raw or chemically treated sewage or other pollutants from boats and marinas must be established and enforced through education, licensing and inspection procedures.

4. *Education and Research*

FACTS

P. 3-17 a. At the college level, 14 universities or colleges have miscellaneous courses in marine science but, as a rule, these courses are general in nature and not specifically oriented to Long Island's marine environment.

P. 3-17 b. The success of marine sciences and ocean engineering on Long Island is directly dependent on the quality of applied and pure research related to the unique Long Island problems and the training of a manpower pool ranging from technicians to PhDs.

P. 3-17 c. The existing higher education institutions do have the potential to develop the necessary programs.

OPINIONS

P. 3-21 a. The applied research should be geared to the problems pertinent to Long Island waters.

P. 3-18, 3-19, 3-21 b. The research programs of the universities should be geared so as not to duplicate programs of effort being conducted elsewhere, i.e., Scripps, Woods Hole, etc.

P. 3-21 c. If the Long Island universities and colleges develop a strong competent knowledge of the relationships of human population to the marine environment, Long Island could become a leader in the understanding of a problem world-wide in scope.

CONCLUSIONS

P. 3-21 a. The educational applied research should be geared to the solving of the physical, chemical, biological and socio-economic problems affecting the Long Island marine environment.

P. 3-21 b. Every effort should be made to coordinate the specific roles and interests of each university in this effort.

P. 3-21 c. Strong programs should be developed to train technicians, research personnel and educators.

5. *Industrial Oceanographic Research and Development*

FACTS

P. 3-24 a. There are several firms engaged in oceanographic research and development on Long Island today.

P. 3-24 b. With the exception of shellfish oriented studies, this research and development is not directly concerned with the marine environment of Long Island but in the development of deep submerged systems and related problems.

OPINIONS

P. 3-25 a. Although Long Island has many unique attributes and locational advantages, research and industry not related to the local marine environment could find many other sites along other areas of the coast.

CONCLUSIONS

P. 3-25 a. If Long Island becomes a center of research and development excellence in *its own marine environment* it can be expected that industrial spinoffs -- research and development, hardware production and maintenance of related hardware -- would result.

P. 3-25 b. Industry has a significant role to play by investing its research talents, efforts and money in bolstering the growth in Long Island based ocean engineering, technology, hardware production and marine food fields.

6. National Marine Laboratory

FACTS

P. 3-26 a. The Environmental Science Service Administration is the only agency presently seeking an east coast location for a combined marine laboratory and base of operations for The Institute of Oceanography and the United States Coast and Geodetic Survey.

P. 3-26 b. The facility would provide approximately 270 primary jobs.

P. 3-26 c. Site selection investigation has been underway by E.S.S.A. along the entire coastline from Maine to Florida. The following criteria have been set forth:

1. The site should contain deep-water port facilities to accommodate at least five vessels at dockage with a minimum of 25 feet of water.

2. The site should contain a minimum of 8 acres.

3. The site should be in proximity to higher academic institutions and other research facilities.

4. The site should be in proximity to an adequate housing supply of low to high cost range.

5. The site should be capable of being serviced by adequately staffed and equipped local ship handling and repair firms.

P. 3-26 d. There are at least four locations on Long Island that currently meet all or most of the criteria:

1. Hempstead Harbor - Town of North Hempstead

2. Port Jefferson Harbor - Town of Brookhaven

3. Greenport Harbor - Town of Southold

4. Fort Pond Bay - Town of East Hampton

P. 3-25
3-26 e. Long Island is competing for this facility with many other communities from Maine to Florida.

OPINIONS

P. 3-25 a. The location of this facility on Long Island would be desirable by enhancing local job activity and reputation in the marine fields.

P. 3-26 b. The facility itself would probably not enhance Long Island's capacity to understand its own marine environment. The research carried on by the facility will relate to a broad area of study and will not be concentrated on Long Island's immediate problems.

P. 3-26 c. Long Island's competitive advantage for obtaining this facility is not greater than many other locations.

CONCLUSIONS

P. 3-25 a. If a site on Long Island is selected the facility would be most welcome.

P. 3-26 b. The major emphasis of Long Island's effort should be aimed at developing research laboratories that will focus on unique local problems.

7. Economic Aspects

The marine environment is important to the economic health of Long Island. The 1965 total value of marine related industries is conservatively estimated at 180 million dollars. (This does not take into account educational dollars, the full value of tourism -- largely dependent on the marine attributes of Long Island -- or current industrial activities in ocean engineering.) A substantial improvement in the health of the marine environment could mean an increase in commercial and sport fishing, tourism and recreation, shellfish production, and boating of at least an additional 100 million dollars annually. The full development of Long Island's marine potential could yield a total value many times this amount. Conversely, a substantial deterioration of this environment could lead to a corresponding decline.

A discussion of the specific marine activities follows:

Commercial Fishing

FACTS

P. 3-27 a. Commercial fishing has long been an important industry to Long Island. The current gross income is $3 million per year, or 6 per cent of the nation's catch.

P. 3-28 b. A clean and productive marine environment is essential to the health of this industry.

P. 3-28 c. Pollution of coastal waters and elimination of wetlands by filling operations has reduced the areas available for fish spawning and growth.

P. 3-28 d. The proximity of Long Island to the Atlantic fishing grounds and the New York market makes it ideally suited for further growth in this industry.

P. 3-28 e. Inadequate management of the fisheries and competition from foreign trawlers, have been a serious problem for the industry.

OPINIONS

P. 3-28 a. Like the shell fish and sport fishing industries, the commercial fishing industry depends heavily on a healthy marine environment. Enhancement of this marine environment would increase employment and provide attendant benefits for Long Island.

P. 3-28 b. The future manpower needs of the industry require the initiation of training programs now.

P. 3-28 c. Inadequate zoning laws have often discriminated against the fishing industry and it has been difficult for it to find suitable locations for its land based operations.

CONCLUSIONS

P. 3-28 a. Although all fish caught by Long Island fishermen do not necessarily breed in Long Island wetlands, many of them mature here and preservation of these wetlands, along with those all along the east coast, is essential for the preservation of the industry.

P. 3-28 b. The growth of the fishing industry is dependent upon the provision of adequate areas for the industry to locate its shore facilities.

P. 3-28 c. Federal and interstate action is necessary to standardize allowable practices along the Atlantic coast.

Shellfish

FACTS

P. 3-31 a. Long Island has 400,000 acres of fully approved active shellfish areas.

P. 3-29 b. Long Island is the nation's leader in hard clam production with 5.5 million dollars. It is only 60 per cent of what it was 20 years ago.

P. 3-29 c Bay scallop production has varied from $100,000 to $700,000 due to year to year setting and survival conditions.

P. 3-29 d. Oyster industry has declined 99 per cent in the past 50 years from 50 million dollars to 1/2 million dollars.

P. 3-29 e. This decline has been due to man-created and natural factors.

f. The principal man-created factors are:

P. 3-30 1. Bacterial pollution resulting from sewage.

P. 3-30 2. Nutrient pollution resulting from duck sludge, fertilizer and sewage.

P. 3-30 3. Destruction of the wetlands by uncontrolled dredging and filling which has curtailed the growth of micro-organisms necessary for shellfish production.

P. 3-30 4. Spraying of DDT and other insecticides on wetlands, which has caused a curtailment of micro-organic growth.

P. 3-8 5. Dredging of shellfish bottom lands destroying their capacity to produce shellfish.

g. The principal natural factors are:

P. 3-30 1. Destruction of natural seed beds by adverse weather.

P. 3-31 2. Encroachment of predators detrimental to shellfish.

P. 3-15 3. Silting of Moriches and other inlets which has lowered the flushing ability of Great South and Moriches Bays.

h. The shellfish industry is also hampered by legal and zoning problems affecting:

P. 3-31 1. Inadequate and outmoded practices concerning leasing of bottom lands.

P. 3-31 2. Lack of suitably zoned shorefront property to locate the land-based portion of the industry.

P. 3-24 3-30 i. The most creative activity in producing marine foods has had its genesis and maximum development here on Long Island in the presence of the four existing commercial shellfish hatcheries.

P. 3-32 j. The shell fish industry has helped itself through research and the use of good resource management techniques.

OPINIONS

P. 3-32 a. Preservation of marine environment and other encouragements to the shellfish industry can result in a substantial increase in employment and attendant benefits to Long Island.

P. 3-32 b. The shellfish industry has the obligation to exert better resource management techniques.

CONCLUSIONS

P. 3-5 3-6 a. All reasonable efforts should be made to preserve the remaining wetlands in their natural state.

P. 3-6 3-9 b. Better controls over dredging are needed so as to consider their effects on shellfish production areas.

P. 3-12 c. Better controls are needed to prevent pollutants from entering shellfish production areas.

P. 3-15 d. Better dredging of inlets, particularly Moriches Inlet, is needed to improve the flushing action of the bay.

P. 3-30 3-32 e. Local, state and federal support for research into shellfish technology, particularly artificial seed production is desirable.

P. 3-30 f. Bi-state (New York-Connecticut) cooperative study into restoration of natural seed bed areas (principally in Long Island Sound near Connecticut), is desirable.

P. 3-31 g. Consideration should be given to zoning shorefront property for shellfish operations.

Fish-Meal Processing

FACTS

P. 3-27 a. Fishmeal of high protein content can be commercially processed on Long Island.

P. 3-27 b. The product FPC (Fish Protein Concentrate) is odorless and tasteless and can be stored indefinitely.

P. 3-27 c. FPC affords an almost limitless supply of food for people and husbandry.

P. 3-27 d. FPC at present is not allowable for human consumption in the United States but it is in some foreign countries.

P. 3-27 e. The Food and Drug Administration is reconsidering its position on FPC at the present time.

P. 3-27 f. The original fishmeal plant in Greenport was underfinanced and, as a result, was marginal and was alleged to be a public nuisance.

g. Existing technology is adequate to allow for the proper operation of such an industry, without its constituting a nuisance.

OPINIONS

P. 3-27 a. Rising levels of population throughout the world, will require vast improvements in protein food production. FPC can help fill the gap.

P. 3-27 b. There is a good potential for an FPC industry on Long Island.

P. 3-27 c. The operation of such an industry would be a boon to the fishing industry, resulting in twelve-month employment.

P. 3-27 d. It is possible that the growth of an FPC industry could lead to the development of ancillary food packaging and processing on Long Island.

CONCLUSIONS

P. 3-27 a. The location of an FPC industry on Long Island is desirable.

P. 3-27 b. Adequate standards are necessary for such operation to prevent any nuisance factors.

Duck Farming

FACTS

P. 3-33 a. Duck farming in Suffolk County is a $15 million annual industry.

P. 3-33 b. Duck pollution of the rivers, creeks and bays is adverse to recreational use and the shellfish industry.

P. 3-33 c. The present duck pollution is an aesthetic offense to the neighboring residents.

OPINIONS

P. 3-33 a. Ducks can be raised profitably up-land.

P. 3-34 b. Elimination of duck pollution under existing operation is a costly endeavor.

P. 3-33 c. The revenue raised by the duck industry is offset by the loss in recreational and shellfish industries.

CONCLUSIONS

P. 3-34 a. Duck pollution must be totally eliminated.

Dredging

FACTS

P. 3-7 a. Dredging is necessary for the creation and maintenance of navigable channels and inlets for commercial and recreational boating.

P. 3-32 b. Marine sand and gravel mining from the North Shore is important to the construction industry in the New York region.

P. 3-37 c. Dredging and the suitable placement of "spoil" can be utilized to create usable property.

P. 3-7 d. Uncontrolled dredging and diking can result in salt water intrusion of the peripheral shorefront fresh water table.

P. 3-7 e. Uncontrolled dredging does result in the destruction of feeding and breeding grounds of fish, shellfish and other wildlife.

OPINIONS

P. 3-7 a. Controlled dredging can result in the improved flushing action in bays and the elimination of duck sludge in creeks, estuaries and bays.

P. 3-10 b. It is possible to reduce the destructive results of dredging in creeks, rivers and narrow estuarine wetlands through the use of proper equipment.

P. 3-8 c. Controlled dredging can improve and rehabilitate the bottoms of bays so that shellfish production can be enhanced.

P. 3-8 d. Dredging can be made consonant with the maintenance of a desirable marine environment.

CONCLUSIONS

P. 3-32 a. All dredging operations must justify or prove their public benefit.

P. 3-31 b. Controlled dredging should take place to stabilize the Moriches Inlet to improve flushing of the bays and to improve navigation.

P. 3-44 c. Regional (Nassau-Suffolk) controls should be instituted on all dredging projects to insure against the destruction of fish, shellfish and wildlife feeding and breeding grounds and loss of wetlands.

P. 3-9 d. Sand and gravel mining operations should be restricted to those projects where mining is the by-product of other objectives, i.e., the establishment or maintenance of proper navigable channels or the buildup of usable public lands.

P. 3-43
3-46 e. Dredging should take place in accordance with an overall development plan for the marine environment of Nassau and Suffolk Counties.

Recreation and Tourism

FACTS

P. 3-34 a. Because of the many miles of coastline on Long Island, marine-oriented recreation forms a major outlet for the Island's residents, as well as non-residents.

P. 3-36 b. The recreation and tourism industry is estimated to do an annual gross business of over $150 million.

P. 3-34 c. The attractiveness of the marine environment must be maintained.

P. 3-34 d. Over 175,000 boats are owned by Nassau-Suffolk residents.

P. 3-35 1. Pleasure boating is enhanced by clean, pollution-free waters.

P. 3-35 2. Boating itself adds to the pollution problem via on-board toilets which pump raw sewage directly into harbors, streams and bays.

P. 3-35 3. The boating industry depends, in part, upon the continuation of sport-fishing for which many boats are used.

P. 3-35 4. The boating and marina industries depend upon continual dredging to provide the necessary navigable channels and harbors.

P. 3-12 e. Eleven Long Island bathing beaches are closed to the public due to pollution by municipal sewerage systems and other sources.

P. 3-36 f. The 1960 Census found over 40,000 seasonal housing units in the bi-county area. The marine environment is primarily responsible for these seasonal housing units.

P. 3-35 g. Sport fishing is an important industry and recreational outlet.

OPINIONS

P. 3-34 a. The preservation and restoration of an unpolluted marine environment is essential to the continuation of Long Island's marine-oriented recreation. Recreational activities themselves have often added, however, to this pollution.

CONCLUSIONS

P. 3-5 a. Although all fish caught by Long Island fishermen do not necessarily breed in Long Island wetlands, many of them mature here, and preservation of these wetlands along with those all along the east coast, is essential for the preservation of the industry.

P. 3-5
3-6 b. Every effort must be made to curtail and eliminate pollution in order to aid in boating and bathing recreation, and to maintain and expand the major portion of the existing tourist business.

P. 3-35
3-36 c. Adequate facilities must be provided to serve bathing, boating and marina needs.

Housing

FACTS

P. 3-37 a. The highest residential land values occur adjacent to or on water frontage.

P. 3-37 b. Water facilities near or a part of a residential development offer the builder a distinct advantage.

P. 3-37 c. The majority of wetlands lost to fill operations in Nassau and Suffolk Counties is due to housing developments.

OPINIONS

P. 3-37 a. The builders as represented by the Long Island Home Builders Institute have an awareness of the value to their industry of a desirable marine environment.

P. 3-37 b. There is a general belief on the builders' part that compatibility between the needs of the industry and maintenance of a favorable marine environment could be achieved.

P. 3-37 c. The builders' first concern is to meet the housing needs of the public.

P. 3-37 d. Land fill and bulkheading, while destroying wetlands, can still provide a desirable waterfront for residential use.

CONCLUSIONS

P. 3-37 a. There is a conflict between the need for homes (as represented by the builders) and the conservation of the marine environment.

P. 3-37 b. The builders are entitled to be notified in advance as to lands designated for permanent conservation.

Real Estate

FACTS

P. 3-37 a. The realtors professional view towards property is toward utilization for greatest profit.

P. 3-37 b. Waterfront properties have the greatest value for residential development.

OPINIONS

P. 3-37 a. The realtors, similar to the home builders, recognize the desirability of a healthy marine environment.

P. 3-37 b. Wetlands should not be converted to more intensive use, i.e., home building, marinas, etc., without consideration of their conservation values.

P. 3-37 c. Discriminatory zoning to achieve preservation objectives is not the best solution to the conflict.

CONCLUSIONS

P. 3-37 a. Land having a definite conservation value should either be acquired by public acquisition of the fee simple, or preserved through modern land development practices, i.e., cluster zoning, density zoning or easements.

Transportation and Deep Water Ports

FACTS

P. 3-38 a. Bulk cargo can be economically handled by water borne carriers.

OPINIONS

P. 3-38 a. Deep water ports offer a potential economic base to the counties in folstering greater use of water borne cargo.

P. 3-38 b. The Fire Island National Seashore will require additional ferry service from the mainland.

CONCLUSIONS

P. 3-26 a. The development of deep water ports is desirable to improve the water transportation for cargo and passengers in Long Island, and to enhance Long Island's position for the eventual location of an oceanographic institute.

PART III
SUPPORTING DATA

CHAPTER A:—
Discussion of the Problem

Section 1 – Background

Historical

The economic and social history of Long Island from the pre-colonial times of the Pouspatucks, Nissaquakes, Shinnecocks and other indian tribes to the present indicates at every period a varying dependency on the marine environment.

Long Island waters offered the indian a rather continuous and ample protein diet to be had literally 'for the picking'. Archeological research indicates that most of the tribes located their encampments near the water.[1]

Many of the first white settlers, arriving from New England in the mid-seventeenth century had to rely heavily on seafood until the ground was broken, sown and harvested. This hardy breed of people were not strangers to the sea. They brought with them a heritage and knowledge of shipbuilding, fishing and sailing. It was quite natural that marine activities flourished concurrent with the development of the soil. Fishing fleets sailed from Greenport and other eastern ports to the Great Banks; whalers from Sag Harbor sailed the world. Baymen and lobstermen, for three hundred years, have collected a rich return from the pursuit of clams, oysters, scallops, crabs and lobsters.

Freight haulage to New York City and New England markets was an established practice by the early nineteenth century. Cordwood cut in central Suffolk County was loaded aboard schooners at the landing at Smithtown and shipped on a regular basis.[2] However, the industrial and agricultural technology, began to have an impact on marine activities by the mid-nineteenth century. Rail service supplanted water-borne haulage. Improved agricultural production lessened the demand on sea products. The discovery of petroleum, natural gas (and later electric illumination) reduced the interests in whaling. The gold strike in California in 1849 also played a significant role in the demise of Long Island's deep-water fishing industry. It was far more profitable to carry miners around the Cape to California, than to search for whales or fish. In addition, many sailors deserted their vocations to join in the search for gold.

With the exception of certain limited aspects of commercial fishing, there has been a steady decline in the marine economy from the 1850's to the present.

This brief resume is not limited to a depiction of Long Island's marine history. Similar relative declines can be traced on a national scale as well.[3] For example, in 1964 the United States ranked in fifth place in fish caught - with 5.1 per cent of the total.[4] Peru, Japan, Mainland China and Russia all exceeded the United States. Perhaps the pioneering efforts related to pushing the frontiers westward; the primary emphasis on industrial development; the abundant availability of high quality food, including animal proteins; the political concept of isolation; and other factors have been responsible in part for the lack of emphasis on the marine environment. However, there is now a resurgent interest in this field.[5] The dramatic accomplishments of the outer space program have indicated areas of parallel interest with submerged space problems. Mineral exploration and oil potentials have enticed private investment in off-shore exploration. The need to improve methods and techniques occasioned by these activities has resulted in research programs - pure and applied.

Interest in ocean or marine activities was generated on Long Island, as a result of the growing national interest, and by provincial concern with the local employment base. During 1962-1963 Republic Aircraft Corporation discharged approximately 10,000 workers. This represented 1.6 per cent of the combined Nassau-Suffolk resident labor force.[6] Subsequently, the unemployment rate in Suffolk County rose from 4.5 per cent to over 7 per cent. There has been a realization that the stabilization of the defense-oriented economic base of Long Island was endangered by fluctuations in defense spending and competitive abilities. Several studies have called for a diversification of economic activity to provide additional jobs and to cushion the effects of sporadic defense allocations.[7] The existing marine industries have also begun to call for governmental action to protect the marine environment. Competition, resulting in part from the rapid urbanization on Long Island, e.g., dredging, wetland loss, pollution, higher land values for shorefront facilities; has contributed to the decline of these non-defense activities. Citizen conservation groups were formed to lobby for intelligent planning of the Island's resources.[8] In response to the needs and in view of the public interest, the Nassau-Suffolk Regional Planning Board created a sub-committee on oceanography.

Governmental and Administrative

On April 26, 1965 the Board determined to include in the development of the bi-county comprehensive plan, a major segment related to the marine environment. The study was hoped to achieve an understanding of the opportunities and problems growing out of the population expansion on the marine environment and to relate this to an action program.[9]

On June 30, 1965 a committee was selected with representation from industry, finance, education, research and regional planning.[10] At the first formal meeting of the committee, held on September 15, 1965 it was agreed that the following broad objectives would be established to guide the group in the conduct of its business:

1. The Oceanographic Committee of the Nassau-Suffolk Regional Planning Board will examine the contributions which marine resources can make to the economic and cultural development of Long Island. In doing this the Oceanographic Committee will attempt to identify and concentrate on those aspects of the geographical situation of Long Island which gives advantages over other areas of the country.

2. The Oceanographic Committee will attempt, in an order of priority, to outline programs including industrial and public spirited support, education at the various levels, and public policies that will enlarge these advantages and tend to develop industry.[11]

In the conduct of the business of the committee a total of 41 meetings were held. More than 50 witnesses appeared before the committee at the various weekly meetings.[12] In addition to verbal testimony, 12 papers were submitted by interested individuals or organizations.

At the start of the committee's activities it appeared that there were two separate areas of interest. These were:

1. Examination of the opportunities on Long Island to participate in the growing national oceanographic and ocean engineering programs of this country.

2. Examination of the oceanographic problems growing out of the effects of population expansion on Long Island's marine environment.

As the work progressed, it became evident that the two areas of interest were inseparable and may be expressed as the examination of Long Island's oceanographic problems and the action required to preserve a favorable marine environment, and the opportunities such action will present for Long Island to become a center of oceanographic activities and a major participant

in the growing national oceanographic and ocean engineering program.

From a planning point-of-view there are three factors of overriding importance to the growth and development of Long Island.

1. The long narrow shape of Long Island.

2. The proximity of Nassau and Suffolk Counties to the super metropolis of Greater New York City.

3. The complex marine environment of Long Island with its extreme sensitivity to the affects of population expansion.

Long Island's shape and proximity to New York City are unalterable, but the complex marine environment is all too alterable. Population expansion on the Island has caused serious deterioration to the once delightful marine environment which has been a major contributing factor in the Island's attractiveness and consequential growth.

Physical Characteristics

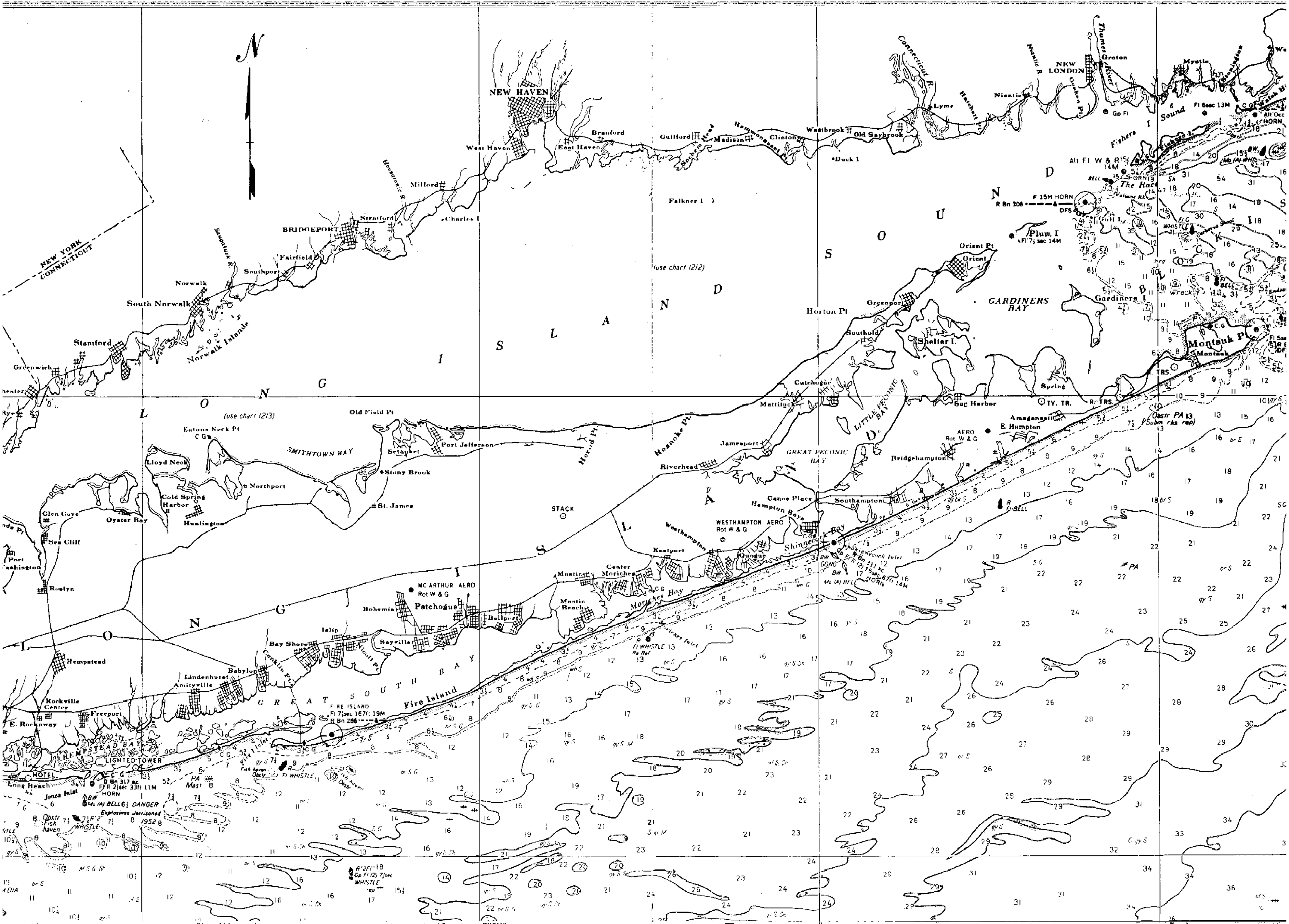
LOCATION - Nassau and Suffolk Counties, with their streams, lakes, rivers, ocean, bays and sound frontages exceeding 1,000 linear miles in total, are familiar natural attributes to millions of persons for the resort and recreation opportunities. Long Island Sound on the north and the Atlantic Ocean on the south and east afford a decidedly unique advantage for the proper development of marine resources. The south shore is paralleled by barrier beaches which create bays between the south shore of the Island and the ocean from Long Beach on the west to the Hamptons in the Town of Southampton. Jones, Fire Island, Moriches and Shinnecock Inlets connect these bays to the ocean. This portion of the Long Island peninsular is over 100 miles long and 20 miles wide at its widest point which is near the Nassau-Suffolk boundary. The major land area extends eastward from the Queens-Brooklyn border with Nassau County for approximately 60 miles to Riverhead. East of Riverhead two forks or peninsulars, continue eastward separated by the waters of Peconic and Gardiners Bays. The northern fork terminates at Orient Point and is approximately 20 miles in length. The southern fork terminates at Montauk and is about 44 miles long. The land area of the two counties is approximately 1,200 square miles.

TOPOGRAPHY - The topography is uniform with a gentle to moderate slope from the north to the south shore. A high ridge of glacial origin running approximately east and west from the north westerly corner of Nassau County and then running in a southeasterly direction through Nassau from the north shore reaches an elevation of about 300 feet above sea level. North of the ridge the topography is generally abrupt with an overall slope to Long Island Sound. South of the ridge is a long gentle slope terminating in the marsh and meadow land which borders the bays on the south.[13] The four main river watershed valleys are located in Suffolk County. These are the Nissequogue in the Town of Smithtown, Connetquot in the Town of Islip, Carmans in the Town of Brookhaven, and the Peconic which occurs in the Towns of Riverhead, Brookhaven and Southampton.[14]

GEOLOGICAL DESCRIPTION-The area is mainly composed of the unconsolidated deposits of sand, gravel, and clay laid down in more or less parallel beds on a hard bedrock surface. The rock floor is tilted downward in a southeasterly direction so that from a position of relative closeness to the surface in the northwest end of Long Island (Queens County) it reaches a depth of 2,100 feet below sea level beneath Fire Island. The subsoil is generally sandy of yellow color except on the ocean side of the south shore dunes which are of light gray sea sand. The topsoil has been particularly suited for agricultural uses. Elsewhere the ground is generally covered with scrub growth, mostly oaks and pine. North of the glacial ridge there is an abundance of flora including many of the hardwoods as well as evergreen cover.

WATER SUPPLY - The water supply is obtained entirely from ground water. Natural replenishment of this supply is derived solely from precipitation, i.e., rain, snow and sleet which averages 42 inches per year. Due to losses from evaporation, stream flow and other factors only part of this precipitation ever reaches the water bearing strata. It has been estimated that approximately 50 per cent of the precipitation is lost due to the above mentioned factors. On the basis of past experience and engineering projections the ground water reservoir appears to be adequate to serve an estimated population of approximately 3 million persons.[15]

MARINE ENVIRONMENT-The estuarian marshes and the off-shore waters, diverse in terms of salinity and temperature, abound in a variety of shell and fin fish. The inland fresh waters, particularly in Suffolk County, have an abundance of trout and bass. A discussion of the actual marine resources will be given in greater detail in the body of this report. It should also be mentioned that another of the marine resources has been the sand and gravel deposits that are particularly rich in the Long Island Sound on the north shore of the Island.


N
NEW YORK
CONNECTICUT
LONG ISLAND SOUND
LONG ISLAND
NEW HAVEN
West Haven
East Haven
Branford
Guilford
Sachem Head
Madison
Hammonasset Pt
Clinton
Westbrook
Old Saybrook
Duck I
Connecticut R.
Lyme
Hatchett Pt
Niantic R.
Niantic
NEW LONDON
Goshen Pt
Thames River
Groton
Mystic
Stonington
Fishers I Sound
The Race
Plum I
Gardiners I
GARDINERS BAY
Orient Pt
Orient
Greenport
Southold
Shelter I.
Sag Harbor
Montauk Pt
Montauk
Amagansett
E. Hampton
Bridgehampton
Southampton
Canoe Place
Hampton Bays
Shinnecock Bay
Shinnecock Inlet
LITTLE PECONIC BAY
GREAT PECONIC BAY
Cutchogue
Mattituck
Horton Pt
Jamesport
Riverhead
Roanoke Pt
Herod Pt
Falkner I
(use chart 1212)
(use chart 1213)
Milford
Housatonic R.
Charles I
Stratford
BRIDGEPORT
Fairfield
Southport
Saugatuck R.
Norwalk
South Norwalk
Norwalk Islands
Stamford
Greenwich
Rye
Old Field Pt
Eatons Neck Pt
SMITHTOWN BAY
Setauket
Port Jefferson
Stony Brook
St. James
Northport
Lloyd Neck
Cold Spring Harbor
Huntington
Oyster Bay
Glen Cove
Sea Cliff
Port Washington
Roslyn
Hempstead
Rockville Center
E. Rockaway
Freeport
Long Beach
Jones Inlet
HEMPSTEAD BAY
LIGHTED TOWER
HOTEL
Amityville
Lindenhurst
Babylon
Conklin Pt
Bay Shore
Islip
Nicoll Pt
Sayville
Bohemia
Patchogue
Bellport
MC ARTHUR AERO
Mastic
Mastic Beach
Center Moriches
Moriches Bay
Moriches Inlet
Eastport
Westhampton
WESTHAMPTON AERO
Quogue
STACK
GREAT SOUTH BAY
Fire Island
FIRE ISLAND
Fire I Inlet
DANGER Explosives Jettisoned 1952

SECTION 2 — Conservation

> The Nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased and not impaired in value.
>
> President Theodore Roosevelt

Wetlands

DESCRIPTION - The marine environment of Nassau and Suffolk Counties include all the bays and barrier reefs, the Long Island Sound, the Peconics, the inner tidal zones, all of the estuarian creeks, and the salt marshes. These areas have often been termed "wetlands". This is confusing to a clear understanding of the marine problem since there are in fact two broad types of wetlands -- fresh water and marine or brackish wetlands. The Carmans, Peconic River, Connetquot, and a portion of the Nissequogue Rivers comprise the former.

The marine wetlands, including the estuaries, creeks and other drains which allow the fresh water runoff from the mainland to flow into the various bays and harbors, have a wide range of salinity from almost fresh (salt free) to those approaching that of the ocean itself.

The brackish environment is a very unique one indeed. The shallow waters -- less than 8 or 10 feet -- are the prime shellfish producing areas. The fresh water runoff from the main body of Long Island is part of the ecological cycle by converting ocean salt water into a brackish state that is vital for the propagation of shellfish. The nature of the bottom is another important factor to be taken into consideration with the issue of salinity. The bottom-lands vary from silt to mud to salt marsh to sand and gravel. Some marine biologists consider the lower or tidal zone -- *Spartina alterniflora* as having a higher value than the high marsh zone -- *Spartina patens*. The *Spartina patens* is that zone of marsh quite common on the shores of the bay which is only flooded at lunar and storm tides. Some marine ecologists claim that differentiation is not at all necessary since both areas are productive.[16] The same type of argument has been going on relative to the type of bottoms. With the exception of a bottom composed of duck sludge, justification can be found as to the value of the various other types.

In any event the entire complex is important for shellfish, finfish, water fowl, many invertebrates, and the entire biological chain which is allowed to survive and prosper relative to the quality of this environment. The success of this wild life is important to man in general and to the Island in particular, not only as a source of food or recreation, including fishing, crabbing, clamming, bird watching, and general aesthetics but as a very substantial portion of the economic base of the Island. It must be understood that the success of this environment in an ecological sense depends on the protection of the entire vast food chain. Each group of animals or plants play a very important role. According to research on the Georgia marshes,[17] the *Spartina alterniflora* marsh is the most productive vegetated area in the world. The vegetable matter is decomposed and crushed out into the water and then detrited with all the carbohydrates, proteins, fats and vitamins finally breaking down and feeding microscopic life. It is reasonable to believe that the complete marine complex -- shallow bays, small estuaries, salt marshes -- found throughout Long Island is one of the primary contributing factors for the rich wild life found along the Atlantic seaboard and that these wetlands are vital to the entire range of shellfish, finfish, and water fowl that inhabit these areas.

Construction Restraints on the Natural Environment

The loss of wetlands due to land fill operations, dredging, and home construction, is at best the choice among alternatives. The most desirable residential areas in both counties have been traditionally, and at the present, along the peripheral shore areas. The highest residential land values occur on those building sites adjacent to, or contiguous with, water frontage. The tremendous demand on available land in Nassau and Suffolk Counties has placed a significant burden on the choice between provision for new families and the protection of the natural resource. A lake or any kind of waterfront land is a valuable asset for the developer and for the people who live nearby. Water frontage creates low maintenance open space, provides many kinds of recreation facilities, and is so popular that it increases surrounding land values up to five or ten times normal value. Almost any kind of water helps a developer to sell in a competitive market. As a result many areas of Nassau and Suffolk Counties, particularly along the south shore, have been under heavy pressure for such development. Most of the loss of wetlands over the past twenty years has occurred due to the filling in of marsh, subsequent bulkheading, and construction thereon.

Filling in of marshes to make real estate must be recognized as the most threatening danger to this environment. Between 1954 and 1959, over 13 per cent of the Long Island wetlands were destroyed by land-fill projects.[18] Over the years, it is estimated that approximately 25 per cent of the wetlands have been destroyed. It is obvious that if this practice is to continue the marine environment will suffer.

VALUE OF WETLANDS[19] - It has been mentioned in the previous discussion on wetlands that these areas are among the most productive of all lands. This contention can be expressed financially. Analyses have been conducted of the shellfish yield per acre in the various tidal flats and bays of Suffolk County.[20] Approximately 50 per cent of the tidal flats of Mount Sinai Harbor, for example, were found to be highly productive.[21] The yield in clams ranged from an average of 36 bushels per acre to a high of 400 bushels per acre in isolated spots. At the wholesale rate to the digger of 7 dollars a bushel, the value in annual yield ranged from 252 to 2800 dollars per acre. These flats are a perpetual source of food revenue. Therefore the actual evaluation of this resource should include the capitalized value of the land. At a net return of 5 per cent per annum, the minimum capitalized value of such land is in excess of 5000 dollars per acre. The areas of highest yield have the very high capitalized value of 60,000 dollars per acre, for shellfish production. It would therefore appear apparent, and almost gratuitous to state, that the preservation of these highly productive wetlands be preserved.

Preservation of the wetlands can also be called for on the basis of their role in mitigating storm surges and tides. Although this Committee has not endeavored to quantify the benefits, it must be recognized that untold losses from storm conditions are prevented by the presence of these marshes. They are in effect natural breakwaters, with the resiliency of the millions of stalks of cord grass serving to lessen the shock of pounding waves. These natural buffers lessen the deleterious effects of hurricane storms on the shoreline.

Dredging

Coupled to the land fill operation in the potential loss of wetlands are the various aspects of dredging.

Dredging can be defined as the removal of submerged material from the water bottom and can include the placement of these materials as fill. Dredging is generally beneficial for the attainment of the following objectives:

Storm surges mitigated by Great Barrier Beach during hurricane in the Fall of 1962.

1. Creation and maintenance of navigable channels and inlets for commercial and recreational use.

2. Creation of useful property, marinas, recreational areas.

3. Improved flushing action in bays, and estuarian creeks.

4. Commercial mining of sand and gravel.

The arguments against dredging are:

1. The destruction of irreplaceable feeding and breeding grounds of fish, shellfish and wildlife. Deliberate modification of the coastline, such as channel dredging for marinas, shoreline modification for beach stabilization and filling in marsh areas for developmental purposes, pose serious problems. These modifications are occurring in estuaries which are important natural resources for recreation and food production. These areas are the nursery grounds for many marine organisms.[22]

2. The lack of control relative to legislation, planning and the consideration of the consequences of dredging.

3. The use of dredging for political, speculative real estate development, or makework projects.

Much of the present debate arises out of the lack of knowledge on the consequences of dredging action. The areas needing clarification would include:

1. Influence of dredging on fish and shellfish ecology.

2. Value of bottom rehabilitation through dredging.

3. Effect of dredging on salt water intrusion.

4. Pollution control versus salinity control.

5. Effect of dredging of inlets and their stabilization.

6. Use of groins for erosion control and beach stabilization.

7. Disposition of dredging spoil.

8. Sand and gravel mining.

Among the testimony heard and the research undertaken by the committee, it would appear that one of the worst examples of the devastation of public resources is that of the indiscriminate dredging of sand and gravel from Long Island harbors.[23] It is claimed that this has resulted in the destruction of the ecology of life in and around the various harbors including destruction of the habitat and food chain of shellfish and finfish.

Dredging can be and is sometimes beneficial. Harbors do silt in and do require circulation channels. Channels for navigation and mooring of boats are necessary. There is also a need for shoreline roads, waterfront power plants, the placement of incinerators and fuel storage tank sites. However, certain compromises must be effected, if ecology and beauty are to be preserved as well. The public works department and the U.S. Corps of Engineers agree that dredging has to be done and that their criterion for the work was navigation. In this regard the President's Advisory Study on Environment stated:

> We recommend that issuance by the U.S. Army Corps of Engineers of permits for dredging, and decisions concerning the Corps' own operations, be continued on the anticipated effect on all resources, not on effects on navigation alone.[24]

It is possible with good planning and proper control to serve the needs of the people of Long Island by providing a more intelligent use of dredging and at the same time also preserving the marine environment.

Particular mention has to be made of the sand and gravel operations. It is these activities in the bays and harbors of Long Island which seem to give cause for alarm by the citizenry and conservationists alike. Some of the dredges used in the sand and gravel operations draw as much as 16 feet. The dredge material is sorted into gravel, sand and silt. The sand and gravel are sent to New York markets or used locally. There is no question that this is a necessary industry. Construction requires these aggregates for the manufacture of concrete. At the present time off-shore sand and gravel mining appears to be the most economical means of securing this material.

Part of the present problem is the result of improperly supervised activities. Since 1955 Mount Sinai Harbor has been under a dredging operation with a private contractor. At the conclusion of the present contract more than 3 million cubic yards of sand and gravel will have been taken from the harbor's bottom. When the operation began the top of the wetlands behind the beach to the north, to a depth of 40 feet, was removed. The dredges were to back fill to a finished grade of 12 feet below water level. However, there still are deep holes in the harbor. The boundaries were also exceeded to the east and the dredges also continued their operation to the south where no boundaries or check points had been established. Approximately 60 per cent or 140 acres of the former wetlands have been lost.[25]

A review of the dredging in Huntington Harbor leads to contrasting opinions. On the one hand the dredgers claim that through their operation the bottom was rehabilitated and should be a greater producing area for shellfish.[26] The shellfish producers claim that 90 per cent of the area dredged was shell producing area of the best quality and that at least a portion of this area will not be conducive to shellfish growth for a long time.[27] It is further estimated that these areas were capable of producing 500,000 dollars worth of shellfish annually.

Dredges contracted to remove the sand bar off Center Island Beach in Oyster Bay were contracted to remove to a depth of about 18 feet

Mean Low Water. This was exceeded to a depth showing up to 33 feet at MLW.

Dredging operations have left the effects of devastation on Northport Harbor, Reeves Bay, Flanders Bay, Oyster Bay, Bellport, and Moriches Bay. It has been calculated that more than 25 million cubic yards of bay bottom have been removed from the Great South Bay and many acres of shellfish producing land have been destroyed.[28]

The U.S. Fish and Wild Life Services report on an application to dredge in Garret Lead in Hempstead Bay dated August 11, 1965 reads:

> Our investigations indicate that earlier dredging materially altered the bay bottom of Garret Lead and destroyed the marsh lands to the north and to the west. Depth soundings taken in the Lead on June 23, 1965 revealed an average depth of 15 feet and maximum depth of 24 feet mean sea level in these once shallow and productive waters.... Complete dredging and filling projects remove valuable productive town owned bay bottom for private purpose. Fish and wild life habitat were seriously and irrevocably damaged despite our recommendations that these applications for permit be denied. We find that we cannot object to issuance of this permit because there are no longer any significant fish and wild life resources in the projected area.

These marshes once supported both commercial and recreational shellfishing. It was an asset worth millions of commercial and recreational dollars for the town and was totally self-perpetuating, needing no cultivation, seeding, fertilizing, or planting by man.

The communities on Long Island have become aware of these problems and several have instituted steps to gain a better understanding of the areas of conflict and hopefully to achieve a balance between the needs for industry and population as well as the needs for preserving the marine environment.

A study is currently being undertaken in the Town of Southold, financed by the Suffolk County Board of Supervisors to study the consequences of dredging.[29] A before and after ecological examination is being made to determine the actual effects of a limited dredging operation.

Another example that could be cited is the Town of Babylon's attempt to preserve its coastal wetlands by instituting a dredging ordinance.[30] The ordinance controls and regulates the removal of land from town owned property by any form of dredging operation. In determining the merits of each operation the town solicits the opinion of the New York State Conservation Department.

The ordinance further provides that applications be accompanied by a statement citing the amount of material to be removed, description of the area in question, and its geographical location based on United States Coast and Geodetic Survey's coordinates of the area, the depth to which such removal is proposed, the sounding of the area in question and a survey of the area where the material is to be deposited. This statement is to be certified by a New York licensed professional engineer or surveyor. The application shall show the officers of the firm and any history of prior dredging operations in Nassau and Suffolk County. Permits are to be granted for removal of material if such material is not required for town purposes and the public interest is not to be otherwise prejudiced thereby. They are also granted on the basis that such removal of material will benefit the town substantially as a necessary improvement of any waterway or waterways affected thereby. The ordinance fixes a time limit on the beginning and completion of the removal operation and further specifies the times when such operation may be conducted or halted. The New York State Conservation Department or other authority shall act as consul-

tants to determine the value of dredge materials and the licensee shall pay the town such sums as fixed by the Town Board for soil, sand or other material removed. The removal of material and the redepositing and storage thereof shall neither undermine, weaken nor deprive of support other lands in the vicinity, nor otherwise adversely affect the waterways of the town and the lands abutting thereon. Unless the permit states otherwise the dredging operation shall not substantially change the course of any channel or the natural movement or flow of any waters or cause or accelerate the drift of underwater soil, sand, gravel, bog or mud and the applicant shall assume all responsibility for any and all operations. When the work is completed the licensee must submit to the director of conservation of New York State a certificate that the work has been completed in accordance with the ordinance and the survey showing that the removal operation has been completed indicating the depth of the area from which material shall have been removed and the slopes from which material shall have been removed connecting with the adjoining lands. In addition the licensee, upon completion of his operations, shall trim and dress the land under water and shall leave specifically required side slopes on the boundaries of any dredging areas adjacent to the shore lines. This ordinance is accompanied with suitable liability in terms of fines and imprisonment for violation of the act.

On April 15, 1965 the New York State Water Resources Commission decided that it was a state responsibility to evaluate and take a stand on all notices of the United States Corps of Engineers relative to dredging. The New York State conservation people assigned to the Long Island area go into the field, examine the proposed projects, try to evaluate each project and return the information to Albany. Within the first six months 110 public notices by the Corps were examined by the conservation people. Of this number the recommendation was that six be denied and of the six the conservationists provided modifications whereby approval could be granted if certain stipulations were met.[31] This would appear to indicate that many of the present conflicts between dredging and conservation values can be resolved.

The Eelgrass Problem

One of the major problems faced by sportsfishermen and boaters in recent years has been a rapid increase in floating eelgrass in Great South and Moriches Bays. Eelgrass grows on bay bottoms in shallow water usually up to six feet in depth, where there are no substantial currents. Its blades can reach a length of over six feet, and when loosened from its roots, floating clumps of eelgrass blades can clog engine intakes, foul nets and lines, and eventually pile up on shore. Rotting eelgrass on shorelines has resulted in the production of such offensive odors as to make it a public nuisance.[32]

It has sometimes been claimed that the increased occurrence of eelgrass was due to nutrient stimulation caused by municipal and agricultural pollutants. However, a recent study by Dr. R.M. Wilson of Adelphi Suffolk College at Oakdale has shown that this is not the case.[33] Eelgrass was very common to Great South Bay before 1932, and in fact was found all along the Atlantic coasts, on the European and African sides as well as on the American side. Due to some unknown reason, but probably due to a fungus-withering disease, this eelgrass began to die off, and during the 1930's almost completely disappeared over its entire range. During the 1940's and 1950's it began to make a sporadic return in most areas but did not revive in Great South Bay until the 1960's. The reason for the return of the eelgrass is as mysterious as its disappearance, and since it has revived in polluted as well as clean waters, the incidence of greater pollution in Great South Bay does not seem to be the cause of eelgrass growth.

During the 1920's eelgrass was harvested and sold as a valuable commodity, selling for anywhere from $20 to $60 per ton, delivered. It found

use principally as an insulation device for homes, as sound insulation, as a substitute for hay, and as a fertilizer. At one time it was used in Canada and France in the making of paper, and at one time in the production of guncotton in Germany. The disappearance of eelgrass resulted in the decline of several communities that depended on it for their livelihood, but the revival of eelgrass has not seen a revival in its use.

> The discovery of an economic use for eelgrass will lead to the final solution of the so-called eelgrass problem. The economic use, which would pay for the cost of collecting, processing and delivering the grass to the consumer, will pay for its removal from troublesome areas. Of the many possible ways eelgrass could be utilized, perhaps its uses as a fertilizer, and insulation, or a packing material are the most preferable and probable for further economic development.[34]

The eelgrass itself can serve to improve the marine environment, since it provides a natural habitat for many species of fish and shellfish, including weakfish, eels, scallops, and schools of juvenile fish seeking protection from their natural predators. The protective aspect of the eelgrass, along with its propensity to produce plankton and its decomposition role, may indicate that the recurrence of eelgrass will increase the quality and quantity of fish in the ocean and bays. It also is the chief food of the Brant (a species of migratory goose). There is an explanation or cure of the floating eelgrass problem, and its attendant affects on boats and fishermen. According to Dr. Wilson, there is much more floating eelgrass along the bottoms than along the surface, and the surface floatation may be the result of boats and dredges, which stir up the bottom and cause the eelgrass to rise to the surface. Where the normal depth of Great South Bay averages about six feet, in many areas dredging has produced sinkholes of twenty feet or more. These holes have accumulated deposits of dead eelgrass and the decay of this eelgrass underwater, without oxygen, has lead to the production of hydrogen sulphide, the "rotten egg gas," so-called because of its smell. This has occurred particularly along shorefronts where fill from the bay bottom has been used to make new homes, parks, and the like. Hence, part of the offensiveness of rotting eelgrass may be a by-product of poor dredging.

The offensiveness of rotting eelgrass may also be caused more by a combination of algae or pollution and eelgrass, rather than eelgrass alone. There is a great need for further research on this problem, as well as research into the general ecology of Great South Bay.

There seems to be no cure for the nuisance that eelgrass has caused, unless private entrepreneurs begin to harvest it as a commercially feasible product. Since one underwater acre can produce about 8-1/2 dry tons of eelgrass, and the growth of eelgrass has been spreading steadily over the last three years, this may be the ultimate solution.

SECTION 3 — Pollution

> The near shore environment is...of critical importance. This environment is being modified rapidly, by human activities, in ways that are unknown in detail but broadly are undesirable.
>
> Pollution, which renders beaches unsafe for swimmers, destroys valuable fisheries and generally degrades the coastline, is the chief modification.[35]

One of the major causes of the diminution in value of the marine environment has been from pollution caused by the presence of an active residential, industrial and agricultural community along its shores.

Sewage

The waters surrounding our shores are a priceless asset which furnish pleasure to county residents and draw thousands of visitors each summer to participate in the recreational pleasures of boating, bathing and fishing. Most of these waters, at the present time, are clean, attractive and unpolluted. Residents and visitors may swim, in most instances, without fear for their health. The inland areas contain many attractive lakes and streams which provide recreation for those who prefer fresh water sport.

Coincident with the increasing population which has occurred along the shorelines evidences of pollution have begun to appear in these waters. For example, the Suffolk County Department of Health has observed through its beach program a slow but steady deterioration in quality of these waters.[36] The pollution first evidences itself in the populous areas and proceeds to fan out. Pollution is inevitable. The shoreline areas are not conducive to the use of individual disposal systems, with the result that the overflow from cesspools, seepage of polluted ground water, and illegal direct discharges of sewage find their way into the surrounding water. Within the past 10 years the Suffolk County Department of Health has found it necessary to refuse to grant bathing permits to a small number of beaches on both the north and south shores and on some inland lakes.[37] A joint survey by the United States Geologic Survey and the Suffolk County Water Authority indicates the presence of ABS (synthetic detergents) in the ground water and in most of the streams tested.[38] This is a positive indication that sewage is finding its way, not only into our drinking water supply, but also into our recreational waters.

Large quantities of shellfish are taken from Great South Bay and Long Island Sound by both commercial fishermen and local residents. Great South Bay was the original "home" of the famous "Blue Point" oyster. The growing and marketing of shellfish is still potentially one of the most profitable natural industries in Suffolk County. At present the New York State Conservation Department prohibits the taking of shellfish from the numerous creeks and canals that empty into the Bay and for a distance off shore of approximately one-half mile. Pollution attendant to populated areas along the creeks and shore front is the reason for this ban.

This form of pollution and its relation to shellfish has been discussed thus far from the sanitary point of view. The Public Health Service, in view of health standards, requires that the conservation department maintain a close watch on all the waters in which shellfish may be taken. Since polluted grounds are very fertile the shellfish do grow well. This, unfortunately, creates a law enforcement problem since there are unscrupulous individuals who, if given the opportunity, will harvest this crop and sell it to unsuspecting buyers.

In order to maintain these waters in a quality state where they can be used without concern for injury to health it is necessary to provide for the public collection, treatment, and disposal of sewage as the only safe manner in which to dispose of these wastes. With a continued population increase in the use of individual disposal

systems with their subsequent failure, pollution will progress to a point where these waters may be hazardous to use.

The provision of public sewers for populated areas would protect the waters of the bays presently open for shellfishing. The failure to provide public sewers will result in the shore front pollution extending further and further into the bays. Similar conditions apply to Long Island Sound on the north shore but to a lesser extent due to more positive dilution by tidal action. In recognition of this problem the Suffolk County Board of Supervisors has authorized the creation of a Suffolk County Sewer Authority for the establishment of a coordinated sewerage system for the western five towns.[39] Nassau County is in the process of establishing its third sewer district.

Industrial and Agricultural Pollution

A second aspect of pollution apart from sanitary concerns may be called nutrient pollution. This results in the over-fertilization of the bays and harbors from all types of upland effluents including lawn and farm fertilizers as well as cesspool and raw seepage, both human and duck farm waste.

> A serious pollution problem which caused the failure of a once prosperous shellfish industry and lessened the recreational use and esthetic value of Great South Moriches and Shinnecock Bays prompted the towns of Islip and Brookhaven to commission Woods Hole Oceanographic Institution to conduct an analytical survey towards finding the causative agents and their necessary remedial measures.[40]

Their findings indicate that these materials entering the Bay waters continually add extra phosphorus and nitrate that eventually enriches the waters to the point where the ecological balance is upset resulting in a diminution of the optimum environment affecting shell and finfish.

Nutrient pollution, particularly in the Great South Bay, has created the problem of fostering microscopic green algae that is becoming so dense (five million to a cubic centimeter of water) that the shellfish find it virtually impossible to survive. In the Moriches and Great South Bays much of this nutrient pollution can be directly attributed to the duck farm operations located on the estuaries. The lack of good flushing action in the Moriches Bay has caused a spread of this nutrient into the Great South Bay. Examination by Woods Hole Oceanographic Institute of many of the duck ponds in fresh water areas indicates the saturation of these ponds with algae that can visibly be detected by the pea soup green color.[41] It is possible that a portion of this problem could be alleviated by the reopening of the Moriches Inlet with a consequent flushing action. However, it would appear that the best solution would be to implement the laws requiring complete treatment of the wastes from the duck farms before discharge into the bays.

Pesticides

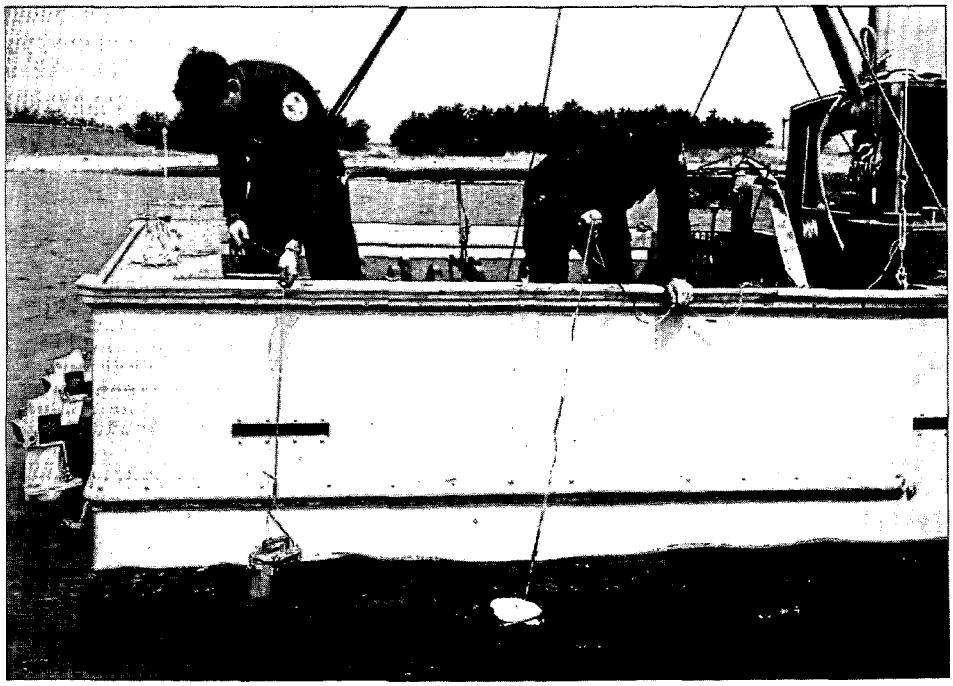
Another area of pollution is caused by the use of pesticides. This is probably one of the most serious because of the difficulty of treating it and the complexity of the results produced by it. It is known that a large amount of chlorinated hydrocarbons, namely DDT, and similar pesticides are used for crop control on the uplands and mosquito control in the salt marshes and tributary streams, in addition to their use in catch basins. Through seepage, ground water flow, and direct contact much of this material finds its way into the bays. Although these pesticides are relatively insoluble, they appear to be transported to the micro-organisms in the water and are concentrated as part of the food chain which results in appreciable amounts being found in fish, fish-eating birds, and other carnivores.

Unfortunately, not much is known about the resultant effects on the marine life other than that

it is clear that some species are killed, rendered sterile, or die in embryonic development, resulting in the reduction of the population of higher forms of life such as fish. The reduction of higher forms of life allows the excessive growth of algae due to duck farm wastes resulting in further pollution by the unconsumed algae dying and decomposing in the bay bottom.

The problem of reducing the pesticide pollution may be attacked in a number of ways, e.g., the search for pesticides with different chemical compositions which would break down into relatively harmless components. This is a worldwide problem. Certainly, beyond encouraging research for such chemicals it is difficult to do much in this area.[42] However, since a large amount of pesticide contamination was due to the operation of the Mosquito Control Commission in Suffolk County, it is reasonable to assume that a great deal of improvement could be achieved by the use of other chemical pesticides. The Suffolk County Mosquite Control Commission has indicated its complete willingness to experiment with new forms of control and has already begun a curtailment of the use of DDT. In Nassau County most of the mosquito control work is done by irrigation and water control to eliminate breeding areas and by the encouragement of biological life that will feed on mosquitoes. DDT was used in the past in Nassau over a four year period. This was discontinued due to the poor results relative to cost. Spraying in Nassau County is done with malathion. In those areas where management is not effective or possible, fuel oil emulsions are used as a larvicide. Most of the salt marsh mosquitoes have been eliminated in Nassau. Most of the existing pest mosquitoes come from stagnant waters. Suffolk County still has tremendous problems with the salt marsh mosquito. Some of the Island's mosquito problems arise from the influx of mosquitoes from Queens and New Jersey.

In other areas of the country, upland marshes have been flooded and biological controls introduced, such as along the New Jersey coast. In other words, the natural balance is relied upon as the means for mosquito elimination. Since the effect of the various programs is unknown, research in this field is obviously indicated.



Water quality monitoring sampling program. Courtesy: Town of Hempstead Department of Conservation and Waterways.

Flushing of Moriches Inlet

The inlet through the barrier beach off Moriches originally existed during the nineteenth century, but closed up around 1886. A new Moriches Inlet was created by tidal action in May of 1931. This new inlet greatly increased salinities in the bay -- for instance, the salinity of the water at Smith Point rose from 12.7 parts per thousand before the opening to 30.3 parts afterwards. Over the years, the channel tended to move westerly and to gradually close. Despite dredging and improvements in 1946 and 1947, the channel closed completely in 1951. Previous to the opening of the inlet, the salinities of Moriches, Shinnecock and Eastern Great South Bays were too low for shellfish production in general, and few if any shellfish were harvested from these areas, although the low salinities were favorable to the production of seed oysters.

After the opening of Moriches Inlet, the production of seed oysters was impossible, as the increased salinities were favorable to the growth of oyster drills, a predator which destroyed the seed every year. However, there was an increase in the productivity of hard clams, which are not bothered by the drills, and oysters transplanted from other waters.

During the 1940's it became apparent that the presence in Great South Bay of a small algae, termed "small forms," was destroying the once prosperous oyster industry. Blooms of these "small forms" at concentration of 3,000,000 per cubic centimeter and higher in some places were preventing oysters from feeding properly. The Woods Hole Oceanographic Institute identified the destructive "small forms" to be chiefly the algae *Nannachloris*, a microscopic unicellular type of plankton that gave the water a greenish color when it bloomed in force.[43] The *Nannachloris* blooms were found to favor waters of low salinity (less than 25 parts per thousand) and by much increased concentrations of dissolved nitrates and phosphates found in Moriches Bay. The cause of the high levels of nitrates and phosphates was clearly the result of duck farm wastes entering the bay from the many duck farms located on its streams.

The Woods Hole reports gave three courses of action to improve the situation of Great South Bay:[44]

1. Reopen and stabilize Moriches Inlet, and provide other inlets to the Bay.

2. Eliminate the pollution of the Bays by preventing duck farm wastes from entering the water.

3. Close off Moriches Bay from Great South Bay by the use of a tidal lock at Smith Point.

In September, 1953, Moriches Inlet was reopened and the shellfish industry immediately revived. Salinities rose, and the counts of "small forms" in Great South Bay declined to near zero. The reopened Inlet reduced the exchange of water between Moriches Bay and Great South Bay, thus curtailing the amount of pollutants traveling from Moriches to Great South Bay. The new inlet also reduced the amounts of phosphorus pollutants in both Bays, by improving the flushing action.

After 1953 Moriches Inlet slowly began to refill due to the natural shoaling of the tides. The bays became increasingly dependent on the level of rainfall runoff from streams to provide adequate flushing of the area. During the last few years the reduction in rainfall has lessened the natural flushing action of Great South Bay. The dredging of Fire Island Inlet, along with the shoaling of Moriches Inlet, has pulled polluted water from Moriches to Great South Bay. The result has been abundant blooms of algae from Moriches Bay to Fire Island Inlet. These algae have been tentatively identified as *Nannachloris* as well as types of diatom and flagellate phytoplankton. The growth of these algae forms has severely affected the growth of oysters, clams, and other fish, and the solution to the problem appears to lie in the direction of dredging Moriches Inlet once more. However, simply dredging the inlet will not be sufficient unless a program of stabilization is also undertaken. Without revetments and breakwaters to stop the continual shoaling action, dredging will not provide a permanent solution to the algae bloom problem.

Tidal movements and signs of shoaling at Moriches Inlet. Courtesy: Lockward, Kessler and Bartlett.

SECTION 4 — Education

Committee deliberations have been held with representatives from conservation, sports fishing, commercial fisheries management, charter boat operators, shellfish, public health, dredging, private industry, and from its own staff membership representing education, atomic research, industrial research, land management, and planning.

It has become clear that the broad field covered by the term oceanography is heavily dependent upon education and research. The term oceanography in the context of the committee's work is defined as the science of the physical, chemical, biological, geological, and temporal interrelationships of the marine environment. Mathematics binds these ecological elements together; engineering techniques translate the academic into workable or applied practices. The study of oceanography therefore calls for a background in a combination of these disciplines. The educational institutions on Long Island are concerned with both the pure science and the applied science aspects of oceanographic studies.

Long Island is indeed fortunate in the increasing number of higher educational institutions. There are 14 universities and colleges which offer some general courses in marine science, ocean engineering and related studies. The following is a brief resume of those offering courses in the fields.[45]

Current Curricula

Adelphi University at Garden City and Adelphi Suffolk College at Oakdale - In addition to basic studies, occasional courses are offered in the general field of oceanography. They are currently carrying out a research study of eelgrass in the Great South Bay, through their Oakdale Extension, which owns four small to medium-sized boats. Adelphi Extension at Oakdale is situated near marine locations and is housed in the same building with the state laboratories of the conservation department.

C.W. Post College at Westbury - Offers regularly scheduled courses in marine biology in The Graduate Department of Marine Science. The school also offers undergraduate and graduate programs in related sciences.

Hofstra University at Hempstead - The Masters program includes oceanography as one area of venture. Regularly scheduled courses in hydrobiology, oceanography (as oceanic biology), and general ecology are offered. Conservation of Natural Resources is offered at the undergraduate level. The school does not have any marine facilities.

Molloy College for Women at Rockville Centre - Basic courses in physics, chemistry, biology and mathematics are offered.

Nassau Community College at Garden City - This two-year college offers basic courses in physics, chemistry, biology and mathematics.

New York Institute of Technology (Old Westbury Campus) - There are two and four year programs in the general sciences, e.g., life sciences, biomedical engineering and aero-space technology.

Polytechnic Institute of Brooklyn at Farmingdale - This school offers graduate engineering and engineering administration programs.

Southampton College of Long Island University - The division of natural science offers courses in sedimentation, geology, marine ecology, and marine botany as well as the general sciences. There currently exists approximately 8,000 square feet of advanced and supporting laboratory space as well as a marine laboratory at Old Fort Pond. They operate three boats and have

adequate dockage. Southampton College is the only one on Long Island that offers a four-year undergraduate program in marine science.

State University Agricultural and Technical College at Farmingdale - Training in practical engineering is offered. These courses relate to the practical aspects of oceanographic operations. It is expected that marine biology courses will be offered in the 1967 fall semester.

State University of New York at Stony Brook - This institution offers the greatest potential for the development of the science of oceanography on Long Island. It has a long range plan of development of educational facilities for studies of the marine environment. At the present time its potential is enhanced by the fact that it has adequate space and facilities for oceanographic research and education. There is a present lack of dockage facilities which, however, are available nearby.

Suffolk Community College at Selden - This school offers a two-year program, in the basic courses. In addition an associate degree is offered in marine technology. The college is engaged in the Goose Creek, Town of Southold study, in conjunction with Fordham, Hofstra and Southampton College.

United States Merchant Marine at Kings Point - This is a Federal school for the training of deck and engineering officers. The four-year program leads to a Bachelor of Science degree.

Webb Institute of Naval Architecture - This school offers a four-year curriculum in hull design and general naval architecture.

Marine Laboratories

In other areas of the nation the direct educational functions are complemented by the work and studies conducted at the various state and federal laboratories. Originally the Cold Spring Harbor Biological Laboratory was devoted to marine research. That work has been phased out and they are now currently conducting investigations in quantitative biological studies. The State Department of Conservation laboratories at Oakdale is the only public facility that now exists in Nassau and Suffolk Counties. At present, however, we do not have anything comparable to other states, such as the Sea and Shore Fisheries Laboratories at Boothbay Harbor, Maine. The academic marine programs offered on Long Island are in an embryonic stage. Many other institutions in other areas of the country have pointed the way such as the Woods Hole Marine Biological Laboratory, Rhode Island University, University of Delaware and several others including Duke University, Rutgers, State University of Georgia, Yale University, New York University, Columbia University, and the University of Miami.[46]

Ryther Report

An excellent report entitled *Oceanography in New York* has been prepared by Dr. John H. Ryther of the Woods Hole Oceanographic Institute as a special consultant to the State Education Department of the University of the State of New York, in January of 1966.[47] The first four sections of the report deal with the various phases of oceanography and its classification as a science. They discuss the development of proposed programs and the organization, scope, and function of various types of oceanographic laboratories.

The fifth section contains an outline of current activities and programs of institutions in the State of New York. A sixth section which is an addenda to the original report contains the following recommendations which apply to Long Island:

1. The curtailment of any venture requiring large

oceanographic vessels. Every effort should be made to avoid duplication of programs.

2. Consolidation of marine geology and geophysics at Lamont Observatory with peripheral study by others of the inshore (estuaries and coasts) processes.

3. Emphasis on areas of physical oceanography and marine meteorology at New York University. The need for peripheral area studies on Long Island is indicated. The lack of present field facilities is indicated.

4. Oceanographic engineering is indicated as a primary interest of the Oceanographic Committee of the Nassau-Suffolk Regional Planning Board. It is here indicated that the relation of Long Island industry to oceanographic engineering is embryonic.

5. General marine biology presently comprises the major interest on the local scene. Dr. Ryther notes the following:

a. The paucity of marine facilities.

b. The need for marine study facilities and of marine science study sessions for introductions to marine life.

c. The difficulties of the faculty in their study because of increased crowding of currently available facilities.

d. The need for a major marine facility laboratory is emphatically outlined with specific provisions for teaching and research, in a natural unpolluted marine environment.

e. The establishment of a deep-sea oceanographic center is premature at this time.

f. Marine microbiology is indicated as a neglected field as well as the area of ecology.

g. The pressing problems of Long Island's concern are pollution of coastal waters and shellfish cultivation.

h. The recreational demands are emphasized.

i. Specific mention is made of the possibilities of the Nassau County Museum of Natural History as a center for a cooperative effort of marine study.

The balance of the immediate discussion relates directly to the educational institutions and covers such issues as: the Nassau County Museum, Sea Grant Colleges, inter-university cooperation, and limitations on the scope of oceanographic efforts.

Nassau County Museum of Natural Histor,

Education in the public appreciation sense as well as in the academic, is the foundation on which an oceanographic know-how will develop. The potentials in the multi-fields relating to the marine environment are largely limited by the capacity developed to staff the laboratories, man the equipment, and convince the general public of the need to protect and enhance the marine environment. The County of Nassau has proposed an imaginative program for the development of a Estuarine Environment Center at Cow Meadow, Freeport, Long Island.[48] This installation would include a floating laboratory, facilities for lectures in marine biology and ecology, and for research into some of the specific problems of the surrounding marine areas. These facilities would be made available to local universities on a 'rental' basis. It is felt by the committee that this effort should be strongly encouraged.

Day excursions to the Museum by elementary and secondary school classes and youth organizations should foster an interest and awareness of the marine environment in our young citizens. From this beginning, it is hoped that motivation to enter some aspect of marine work of further study will be achieved by some of the students. In addition, the general public could become better informed on the relationships of Long Island's unique environment to the daily life of its people.

Sea Grant Colleges

In 1862 the Congress enacted the Morrill Act which provided free grants of federal land for the establishment of Land-Grant Colleges for the study of agriculture and mechanic arts. The concept was one of setting aside federal lands in each of the states in the amount of 30,000 acres for each senator and representative in Congress. Several of the eastern states, with already established universities and without federal lands within their borders would have been omitted from the program. Congress also provided that, in these cases, funds be provided in lieu of land.

The current recognition of the need for education relative to the marine environment, including underwater agriculture has resulted in a reappraisal by Congress of the desirability of expanding the Morrill concept to include sea-grant colleges. Dr. Athleston F. Spilhaus, Dean of the University of Minnesota's Institute of Technology is credited with advancing the concept. He commented in 1963:

> I have suggested the establishment of 'sea-grant colleges' in existing universities that wish to develop oceanic work. The sea-grant college would focus attention on marine science, and it would develop strengths in the applications of marine science in colleges of aquaculture and oceanic engineering. These would be modernized parallels of the great developments in agriculture and the mechanic arts which were occasioned by the Land Grant Act of about a hundred years ago. Basic funds, undesignated except that they be used by sea-grant colleges, could be obtained in much the way that agricultural support has been obtained in the past. Establishment of the land-grant colleges was one of the best investments this nation ever made. The same kind of imagination and foresight should be applied to exploitation of the sea.[49]

As an outgrowth of the 1963 conference, Dr. Spilhaus with nine others formed a committee to examine in depth the sea-grant proposal. They later wrote:

> A sea-grant college would specialize in the application of science and technology to the sea, as in underwater prospecting, mining, food resources development, marine pharmacology and medicine, pollution control, shipping and navigation, forecasting weather and climate, and recreation uses. It would relate such application to the underlying natural sciences, which underlie social sciences as they are affected by, and in turn affect, the occupation and exploitation of the sea.[50]

The 89th Congress passed such legislation. The Act provides for federal grants to selected institutions currently engaged in studies of oceanography and related marine sciences to encourage further advances in the field. Twenty million dollars was authorized for the first two years - 1967 and 1968 - with a 15 per cent limitation on any one state. In other words, New York State is elegible for a maximum of 3 million dollars in aid over the next two years. The funds are to cover two-thirds of the project cost, with the remainder furnished by the recipiant.

It is apparent, that this legislation offers a tremendous opportunity to the universities and colleges of Long Island in advancing their capabilities and knowledge in the marine fields.

Inter-University Cooperation

Oceanography as a study is an interesting phenomenon. One can observe a dichotomy consisting of the very specialized nature of the marine environment and its attendant problems, and the almost limitless range of activities, interests,

opportunities, and study areas. If Long Island is to achieve optimal results in the understanding of its own environment it becomes almost axiomatic that duplication of investment in time, facilities and manpower is to be avoided. Moreover, coordination - particularly in the educational efforts - must be a paramount concern. The amount of investment in any one area is limited. Therefore, pooling of resources, e.g., marine laboratories, library research sites, and equipment is essential to efficiency. The problems must be placed in a sensible order of priority for solution. This requires a cataloging of problems to insure completeness. It also requires a concensus as to assignment. This may be resolved by individual institutions each selecting its own area of interest, or a joint operation by two or more schools interested in the same problem, or a combination of the two approaches.

The nature of the sea-grant legislation is another argument in favor of coordination. A unified approach by the local schools should result in a more comprehensive and strong proposal that would enhance Long Island's competitive advantage in relation to other areas of the state.

Summary

Long Island has a unique marine environment. The varieties and degrees of flora, fauna, salinity, economic activity, population impact and pollution - its own ecological system - contained in a geographically measurable package, can be considered as a laboratory. Each of the marine associated assets or debits serves as a constraint on the economy to the degree that its furtherance or elimination is limited by the available knowledge.

Therefore the educational efforts on Long Island should be geared to the solving of the physical, chemical, biological and socio-economic problems pertinent to Long Island waters. If the local schools develop a strong competent knowledge of the relationships of human population to the marine environment, Long Island could become a leader in the understanding of a problem world-wide in scope. The success of marine sciences and ocean engineering on Long Island is directly dependent on the quality of applied and pure research related to the unique Long Island problems and the training of a manpower pool ranging from technicians to PhDs.

In essence, we are calling for an inner-directed program. Any attempts to compete with or duplicate on-going programs such as at Scripps or Woods Hole would be a weakening of the long-range local potential. The proper time for a widening of objectives will come with maturity of experience, coupled to private industrial initiative.

SECTION 5 — Industrial Research

The Problem

Long Island's most challenging problem is to carry out a research program that will generate the knowledge necessary to manage its own marine environment in the face of population expansion. There are many places around the world with marine environments similar to Long Island's that now or will have a requirement to understand the interaction between their population growth and their marine environment. If Long Island develops a strong capability in the understanding and solution of its own problems it will be well on its way towards being the world center of such research.

Extensive research programs will be required before we adequately understand the various contaminants from human, household, industrial, pesticidal, herbicidal, or agricultural wastes: how these contaminants reach the marine environment; their effects on the biology and chemistry of the environment; and their flushing by the physical oceanography of the off-shore waters. The type of research needed would have to be a comprehensive study that would lead to an understanding of the complex interaction of many different factors upon one another. Some of these important factors are:

1. The life cycle of fish and shellfish.

2. The role of the wetlands and the measure of the productivity by type of wetlands.

3. Investigations of the role our coastal lowlands (estuaries, marshes and lagoons) play in the life histories of many important fishes and shellfish and how they are affected by pollution and other man-made alterations.

4. The productivity and the role of the bottom lands in fish and shellfish production.

5. The complex role of algae, bacteria, and other plankton forms in providing food, and in decomposing wastes and bottom sediments.

6. The biology and chemistry of the aquatic environment, the relative contribution of various sources of nutrient elements, and potential means for the effective control of the aquatic plants that flourish in enriched waters and of over-enrichment itself.

7. Physical oceanography of storm surges, tidal actions and flushing times of bays and estuaries and the affects of dredging upon flushing times, salinities and fauna.

8. The impacts of pollutants, such as phosphates, nitrates, insecticides, herbicides, detergents, and other industrial and household wastes upon the flora and fauna of the marine environment.

9. The development of more objective techniques to measure the tolerance levels of different organisms to pollutants and to identify and assess the changes in abundance and distribution of organisms making up biological communities under pollution stress.

A better knowledge of these complex biological, chemical and physical interactions is required before effective plans can be laid for the conservation and full utilization of Long Island's marine environment.

Local marine research to date has been sporadic, uncoordinated and unrelated. The problems of Long Island are not concerned with deep-sea oceanographic projects but with problems associated with in-shore marine sciences. Furthermore, comprehensive studies of the marine environment need to be put on a continual basis, so that data can be collected over a series of years for the purposes of analysis. It will be necessary to define the data to be collected, and when and where it is to be collected. It will also have to provide for data interpretation to generate knowledge in sufficient detail to support

effective planning. While it may be started on a pilot basis, it will certainly grow into a large and expensive program.

Almost all of the data collection necessary to the acquisition of an understanding of the effects of population growth on Long Island's marine environment must be done on the Island itself, and in its adjacent waters. Furthermore, it will be expedient if data interpretation is also done on the Island close to the scene of the data collection.

Procedures

The level of success to be achieved in the implementation of a comprehensive research program will depend in part on the administrative and organizational procedures that are adopted. There are several approaches that can be taken. The following schedule is an example based on the assumption that initiation, coordination, and control will be centralized. Other logical sequences can similarly be developed for other forms of administrative management.

a. DEFINITION OF SCOPE - It is suggested here that a review and examination be made of the local marine environment, existing problems and areas of conflict, and potential problems; with the view towards the identification, definition, and description of the specific research efforts that must be carried out to gain a total, or near-total, understanding of the local system. Since much of this is contained in the body of this report in descriptive language it may appear that this phase has already been completed. Actually, the list contained herein is far from complete. In addition it is necessary to differentiate between that research which will add to the accomplishment of the practical or economic needs from that which has esoteric value. This is not a debate between pure and applied research; or even between applied research that has an immediate return as contrasted to the long return. *All* research that adds to knowledge is desirable. However, the aim here is to place a focus on that body of research that is needed to solve the problems as stated in the context of this report.

For this purpose, it seems reasonable to recruit a team composed of marine biologists, physical oceanographers, limnologists, marine ecologists, and other such scientists as are necessary. This group should be representative of the best talent available in the Nation. They would be responsible for the definition of scope of the program.

b. TRANSLATION - Once the scope is established, it becomes necessary to organize the discrete parts into a program. This requires a translation from the descriptive language -- e.g., we must study the effect of dredging Moriches Inlet as a method of pollution control of Moriches Bay -- into research language -- e.g., we must systematically monitor flushing actions, impacts on salinity, sand drift, levels of nutrient aggregation and so on, relative to dredging the Moriches Inlet to relieve the pollution of Moriches Bay. The work of translation would also be conducted by the team of consultants.

c. PRIORITIES - The money and trained personnel needed to carry out a research program of this nature is limited. Therefore, it is prudent to establish a time schedule or priority roster for the overall program. The first step would be the selection of a pilot program. In this pilot project methods could be tested, interrelationships formed, observation posts established, equipment developed, and personnel trained.

The design of the pilot program is a very complicated process, involving numerous choice or priority decisions on the topics of study, timing of work, and locations for study. There are two types of priority involved -- technical and economic -- in the context of this discussion. There are others, e.g., bias and expediency.

Technical priority refers to the logical sequence that must be followed to insure scientific rigor, avoidance of duplication, and coordination of many steps into a complete entity. Economic priority refers to solving the problems first that may yield an immediate return, or that require solving to avoid irretrievable losses. For example, research on sand drift may be valuable in coping with erosion control, beach buildup, channel stabilization and ecological changes in bottoms. The information gained from such study could result in new control techniques that would save millions of dollars. On the other hand, a specific research project on wetland ecology could yield similar returns in improved fish and shellfish production. Both cases involve important areas of concern. A priority choice would probably result in the selection of the wetland study, since there is a continuing attrition of these irreplacable resources. It should be stressed that this discussion is for explanation purposes, and no qualitative distinction is meant to be inferred. In point of fact, the initial pilot study should cover as broad a range of studies as possible.

The consultants would advise on the technical priorities. However, the economic priorities must be chosen by the local interests.

d. PROPOSAL FORM-The pilot program written in research language must now be put into proposal form. This includes the scope of services, performance standards, timing, monitoring procedures, legal requirements, and form of reports.

e. SOLICIT PROPOSALS - All qualified research groups: educational, institute, industrial or private, should be invited to submit proposals in accordance with the established forms.

f. SECURE FUNDS AND AWARD CONTRACTS - On the basis of submitted proposals, funds should be sought from federal, state, and local governments, foundations and other private sources, to finance the pilot program. It is the Committee's strong opinion that substantial financial support can be expected. Emphasis of such support has documentation in the recent report of the President's Scientific Advisory Committee, *Effective Use of the Sea.*[51]

Contracts should then be awarded solely on the basis of costs and competence. If the local schools and research facilities combine their strength and concentrate on Long Island problems, they should receive as much support in the form of assignment of responsibility in the program as their capabilities and costs will permit.

g. MONITOR CONRACT-The pilot project should be monitored to insure maximum results.

h. ANALYZE AND REDEFINE-The results must be objectively assessed at the completion of the pilot project. The original consultant team should be reemployed for this purpose. Redefinition of subjects, objectives, priorities, and methods should then occur.

i. ITERATION - Steps b-h should be repeated for the expanded program.

Facilities

The ability to carry out a wide range of research projects is in part dependent on the availability of research facilities, i.e., proper sites, laboratories, and supporting equipment. There is a current paucity of such facilities on Long Island. although several private firms are engaged in oceanographic research and development on Long Island. It is estimated that the current annual investment for commercial research by private firms amounts to 2-1/2 million dollars. However, with the exception of shellfish and pollution-oriented studies, this research and development is not directly concerned with the marine environment of the Island but in the development of underwater commercial and military

products. Although Long Island has many unique attributes and locational advantages, research and industry not related to the local marine environment could find many other sites along other areas of the coast.

What are needed are facilities devoted to the problems of the local unique marine environment. If excellence is developed in this direction it can be expected that industrial spinoffs -- research and development, hardware production and maintenance of related hardware -- would result.

LOCAL EFFORTS - Industry has a significant role to play by investing its research talents, efforts and money in bolstering the growth in Long Island based ocean engineering, technology, hard ware production and marine food fields. In fact, the major initiative must come from the local community, public and private.[52] This does not preclude federal or state participation. It would be welcome. Realistically, it must be recognized that federal and state support is eagerly sought by most communities. Those communities that develop a capacity and know-how should be in a more favorable competitive position.

There are several encouraging signs that this is taking place. Nassau County and the Town of Hempstead have proposals advanced by the Nassau County Museum of Natural History and the Department of Conservation and Waterways for the creation of new research facilities.[53] The County of Suffolk has made park lands available for research sites.[54] Local universities and colleges are indicating their desires and intentions to enlarge their efforts in marine research. These programs and efforts should be strongly encouraged.

STATE PARTICIPATION - The State Education Department has designated Stony Brook University as the marine science center for the entire New York State University system.[55] The Institute of Marine Sciences at the school will provide a strong nucleus for research development on Long Island. Flax Pond has been acquired by the State to be used for marine biological work. In addition, the New York State Department of Conservation is investing 1.65 million dollars for marine research facilities on the campus at Stony Brook and its related facilities at Flax Pond.[56]

Other state programs have and will serve in a peripheral support role. These include the funding of land acquisition programs,[57] and the various grant provisions of Section 5A of the Conservation Law for water and pollution studies.[58]

FEDERAL PARTICIPATION - Direct research projects relating to the local marine environment have been undertaken in the past by the U.S. Coast and Geodetic Survey and the U.S. Corps of Engineers on tide studies, bottom topography, channel development, harbor dredging and erosion control. The Corps was recently assigned the task of carrying out a pollution study of Great South Bay.[59]

These activities all contribute to the store of knowledge. However, the most publicized role of federal participation has been about the possibility of establishing a major national oceanographic research institute on Long Island. Speculation in this direction was given impetus by the creation on December 26, 1965 of an Institute for Oceanography.[60] This followed previous centralization moves, such as the merging of the U.S. Coast and Geodetic Survey, the Weather Bureau, and a Radio Research Laboratory into the Environmental Science Service Administration.

Dr. Harris B. Stewart, Jr., the Director of the Institute in talking of the long-range objectives said, "...like all oceanographers, I would like to see the Institute's headquarters on a coastline." He added that the prospects, however, are a long time away. The promise of achieving prominence and economic gain by virtue of such action is indeed inviting. The likelihood of this occuring is another matter. In the first place, there is considerable confusion concerning the various types of national marine laboratories and institutes that could or would be established on Long Island. In the second place, there must

be a realistic appraisal of Long Island's competitive position among the other communities, from Maine to Florida, with similar aspirations. The PSAC report[61] recommended two types of facilities--a data center, and specialized laboratories and facilities for marine studies.

The data center should function as the country's chief supplier of oceanographic data. The existing National Oceanographic Data Center, funded by contributions from various agencies is operating at far less capacity than current demands warrant. Increased activities in ocean research, both federally and privately raise the importance of the Data Center. The Panel recommended that a substantial increase over the present 1.4 million dollars be funded so that the Center can substantially improve its services.

They also recommended that the specialized laboratories and facilities should be "...appropriately located, whenever possible, near universities or other scientific centers for the contributions that such centers can make."

Among the laboratories called for, mention is made of the need for a temperate zone marine laboratory. This is the only facility that bears close relevance to Long Island.

> Temperate Zone Marine Laboratory with controlled environment facilities for maintenance and study of communities and organisms of the temperate seas, especially those of the open oceans, including food fishes. Its location should be readily accessible to the open sea to permit direct support of field studies as well as laboratory investigations.[62]

At the present time there is only one proposal put forth by any agency of the federal government for the immediate creation of a marine-oriented facility on the east coast. The E.S.S.A. plans to establish a joint facility for the Coast and Geodetic Survey and the Institute for Oceanography on the east coast. The facility would provide for a marine research laboratory employing 70 technicians and scientists. It would also provide berthing and a base for ocean vessels of the survey which have a combined complement of 200 men. Four sites on Long Island, as well as many others on the east coast meet the site selection criteria established by E.S.S.A. The following criteria have been set forth:

a. The site should contain deep-water port facilities to accommodate at least five vessels at dockage with a minimum of 25 feet of water.

b. The site should contain a minimum of 8 acres.

c. The site should be in proximity to higher academic institutions and other research facilities.

d. The site should be in proximity to an adequate housing supply of low to high-cost range.

e. The site should be capable of being serviced by adequately staffed and equipped local ship handling and repair firms.

Four locations on Long Island that currently meet all or most of the criteria are:

a. Hempstead Harbor - Town of North Hempstead

b. Port Jefferson Harbor - Town of Brookhaven

c. Greenport Harbor - Town of Southold

d. Fort Pond Bay - Town of East Hampton

However, it must be observed that the research carried out by this facility would not be aimed towards the solution of Long Island's marine problems. Therefore, the importance of the location of the E.S.S.A. facility on Long Island in this regard has been locally overemphasized. The major emphasis of Long Island's effort should be aimed at developing research facilities that focus on local problems.

SECTION 6 — Economic Aspects

The marine environment is important to the economic health of Long Island. The 1965 total value of marine related industries is conservatively estimated at approximately 180 million dollars (see Table II). This does not take into account educational dollars, the full value from tourism -- largely dependent on the marine attributes of Long Island -- or current industrial activities in ocean engineering.

A substantial improvement in the health of the marine environment could mean an increase in commercial and sport fishing, tourism and recreation, shellfish production, and boating of at least an additional 200-250 million dollars annually. The full development of Long Island's marine potential could yield a total value many times this amount. Conversely, a substantial deterioration of this environment could lead to a corresponding decline of this segment of the economy.

A discussion of the specific marine activities follows:

Commercial Fishing

The U.S. Bureau of Commercial Fisheries reports that the annual value of commercial fishery of eastern Long Island is worth a total of 3 million dollars dock side of which food fishery is valued at 1 million dollars. The balance represents industrial fish. Long Island produces about 6% of the total fish caught in the nation.

The food fishery concentrates on flounder, bluefish, fluke, mackeral, cod, whiting, striped bass, swordfish and others. The industrial fishery concentrates on fish not used for direct consumption; such as menhaden, hake, scup, butterfish, and other "trash" fish. Menhaden and scup form the major portion of Long Island's fishing business, both by weight and by volume (see Appendix A-13). In recent years there has been a marked decline in menhaden catches which has led to a concentration on other types of "trash" or industrial fish.

The output of the industrial fishery is used to make fishmeal and fish oil. The ground up whole fish produces a fishmeal of about 60-74 per cent protein content. The use of fishmeal in the poultry industry has allowed for the production of chickens at less cost and in less growing time and has given the United States the competitive edge in world markets in broilers and fryers. Fishmeal is also used as a food for cattle, mink, hogs and other animals, as well as trout.

An improved type of fishmeal called fish protein concentrate (FPC) can also be produced from these industrial fish. This product is odorless and tasteless and can be stored indefinitely without spoilage, since all of the fish oil has been removed. A plant for producing FPC was recently established in Greenport, entailing an investment of over 1 million dollars.[63] Unfortunately, this plant created a public nuisance with its odor, and together with a shortage of fish, these circumstances have forced it to close temporarily. There is however, a good potential for an FPC industry on Long Island, if adequate standards are instituted to prevent nuisance factors. The operation of such an industry would be a boon to the fishing industry, resulting in twelve-month employment. It is also possible that the growth of an FPC industry could lead to the development of ancillary food packaging and processing on Long Island.

Fish oil is a product of several uses -- particularly as a cooking oil. However, products made from whole unviscerated fish, such as fishmeal, FPC, and fish oil, cannot be used for products for human consumption in the United States. The Food & Drug Administration is reconsidering its position on FPC, since it has great potential for feeding people.[64] Fish oil can be used in Canada to make margarine and for cooking oils, but it cannot be so used in the United States.

The health of the fish industry is intimately tied to the health of the wetlands. The wetlands are a producer of plankton which forms part of the food chain of larger fish. Smaller fish feed on these minute food stuffs and in turn are food for the larger fish. Furthermore, the wetlands serve as a spawning and nursery area for the larger fish. Menhaden, for example, spawn in the ocean or Long Island Sound. When the young fish are about one inch long they swim to the seclusion of the wetlands, where they find their food supply, as well as protection from larger fish. After spending about eight months in these shallow, estuarine, nursery areas, they return to the ocean during the winter and may migrate to the south. By this time they have been transformed from slender, transparent larvae into deep-bodied juveniles, resembling adult menhaden. Although all fish caught by Long Island fishermen do not necessarily breed in Long Island wetlands, many of them mature here, and preservation of these wetlands along with those all along the east coast, is essential for the preservation of the industry. Without these tidal wetlands, the life cycle of the menhaden, as well as flounders, fluke, and others, would be broken.

Besides the gradual encroachment of housing, the productiveness of the wetlands has also been curtailed by pollution from homes, industries, pesticide spraying, and municipal sewerage. Furthermore, many of the dredging operations undertaken in the past have been detrimental to maintaining the wetlands as producers of food products necessary for maintaining fish life. Hence, wetlands which have not been destroyed completely, often show very marked reductions in their productivity.

Long Island has a natural advantage in its proximity to the Atlantic fishing grounds, and Greenport, Long Island is actually as close to them as New Bedford, Massachussetts. Although Greenport is a good, deep water port with adequate docks, improvement of the dock facilities could attract industry to the area.

The bigger problems faced by the fishing industry are of broader scope than can be solved by this committee. Russian trawlers operate within 25 miles of our coast and are government developed, owned, and operated. The U.S. has very few boats big enough to compete with the Russians, or a source of labor willing to venture out to the fishing banks for weeks at a time.[65] The fishery industry is also hampered by a lack of international controls over many fisheries, obsolete crew requirements on large boats, training programs and the lack of government subsidies or financing enjoyed by other countries.

Shellfish

Senator Claiborne Pell imaginatively describes the view of oceanographic activities from a manned space station called "Seascan" in the year 1966.[66] The fascination of his predictions is that they are reasonably possible. It is the current responsibility to make them probable.

> Seascan is approaching the most active seacoast in the world. In the bays and estuaries of the Southern New England shore are acres of farms in which varieties of seaweed, lobsters, oysters, clams, mussels, and transplanted North Sea sole are cultivated. On Long Island, not far from Orient Point, is the great nuclear complex in which sea water is desalinated and fresh water piped to the mainland, minerals are extracted from the bitterns, and millions of kilowatts of power are produced. The island bays near the nuclear plant are also sea farms, using the waste heat to cultivate odd warm-water creatures from which biological medicines are extracted.
>
> The entire east coast is marked with sea farms, and their products are famous...[67]

The shellfish industry has a long history of operation on Long Island. Such trade names as

the Blue Point oyster have made Long Island world famous in this area. However, the passage of time has seen Long Island fall from its predominance in this field. Fifty years ago, Long Island produced 3,300,000 bushels of oysters a year. As recently as 15 years ago, though production had fallen to 1,250,000 bushels a year, the Island still ranked as the nation's leading oyster grower, and accounted for 13 per cent of the country's total production. At its peak the oyster industry employed 3,000 people and produced a crop valued today at 50 million dollors.[68] But in 1964 production had fallen to 28,462 bushels valued at 315,000 dollars and represented only 1 per cent of the nation's total output. Employment had fallen from 3,000 to a few hundred.

The hard clam industry has fared somewhat better, with production increasing in the last several years. In 1965 the clam industry produced 5.9 million pounds of clams valued at 5.1 million dollars. The value of the total 1964 shellfish crop was 8.8 million dollars, which includes .7 million dollars in bay scallops. The decline in the oyster industry has been partially offset by an increased concentration on hard clams. (Appendix A-12, A-13 lists the amounts of shellfish caught in recent years by types). Hard clams are harvested by baymen working with tongs, or by shellfish farmers who seed leased areas and harvest the crop with hydraulic harvesters. Clams are graded into three categories – Little Necks, Cherrystones and Chowders. The small clams bring as much as 14 dollers per bushel while the larger bring about 3 dollars per bushel, depending on the market. New York State is the country's leader in the production of hard clams, due to Long Island's output.

The decline of Long Island's oyster industry, and the problems of the shellfish industry in general can be traced to several causes -- some man-made and some natural. It takes five to eight years to grow a marketable size crop of oysters and clams. With respect to oysters, the shellfish farming operation involves a seeding stage (natural or by hatcheries) and a cultivating stage. In the natural setting, mature male and female oysters in spawning beds emit sperm and eggs into the water. A mature oyster can lay about 100 million eggs a season. Fertilization takes place in the water currents, and the resulting larvae swim freely for approximately 10 days to three weeks. Eventually, they fasten or "set" on to shells, rocks, and other suitable material on the bottom of an open water floor of a seed bed, usually found in a bay or harbor. Long Island possesses several areas which are brackish enough (low salinity) to permit natural oyster setting, however, the highest percentage of the best natural set has been grown in Connecticut waters. Due to a variety of factors, Connecticut seed production has fallen to less than 1 per cent of what it was fifty years ago.

During the next stage, the cultivating stage, the farmer must shift the baby oysters, or "spat", from the seeding beds to the growing beds, and then to shaping beds and finally to fattening beds. All during this period of growth the farmer takes steps to eliminate the natural enemies of the oyster (predators such as starfish, drills, and conches). After a period which can be as long as eight years the shellfish can be harvested and sold.

Long Island has many salt water bays with small fresh water streams feeding into them that are highly favorable areas for farming of shellfish, particularly oysters and hard clams. At the present time, New York State leads in the production of hard clams, although it no longer leads in oyster production as it once did. Shellfish can be one of the readiest sources of nutritional production from the sea. For example, forty tons of shellfish can be produced from one acre of underwater property.[69] Moreover, shellfish contain twice as much iron, pound for pound, as sirloin beef. They are rich in copper, phosphorous, calcium, iodine, and Vitamins A,B,C, and D. They are a food with a low caloric content.

There are four elements necessary for successful shellfish farming:

1. Adequate sources of shellfish seed.

2. Clean waters and adequate food supply.

3. Control of underwater and shore front property.

4. Control of natural predators.

1. SOURCES OF SEED-There has been evidence that natural set as a source of seed will face extinction unless immediate steps are taken to remedy the situation. One of the main reasons for the accelerated decline was the catastrophic storm of November, 1950 which virtually wiped out the natural seed and spawning beds in Long Island Sound. The disappearance of a number of oyster firms after the storm also reduced the fight against predators. A bi-state (Connecticut-New York) cooperative study and development program to achieve the restoration of natural seed areas (principally in Long Island Sound near the Connecticut shore), is desirable.

An alternative approach which has only recently been pursued is the controlled production of seed by special pond culture or hatchery techniques.

Pond cultures have been used in Europe and Japan, and only on a limited extent in this area. There exists several ponds on Long Island which could be adopted to seed production by application of these foreign techniques. For example, the use of Japanese techniques in a pond on Fisher's Island produced over $100,000 of seed oysters in one year. A brighter prospect is the development of hatcheries or greenhouses where seed can be produced under an environment of controlled temperatures and food supplies -- such as protozoa and algae -- needed to grow oysters. The four existing hatcheries are too small to supply all of the seed needed to revive the oyster industry.

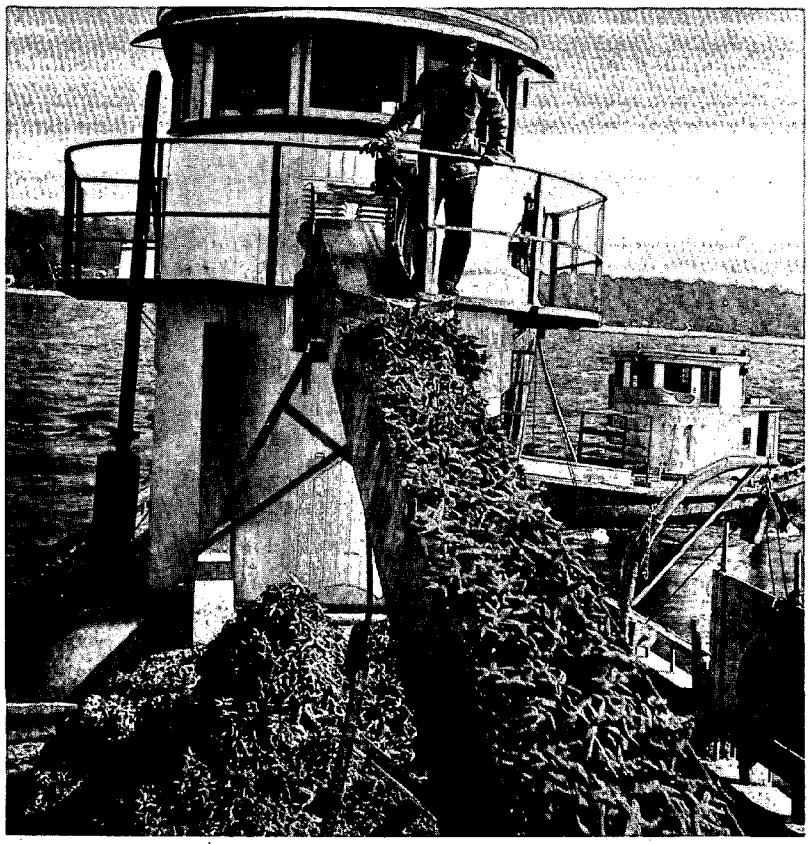
2. CLEAN WATERS AND FOOD SUPPLY – Shellfish can only grow if there is an adequate food supply in the waters they inhabit, and if these waters are free from toxins. Bacterial pollution can contaminate otherwise harvestable shellfish, and ruin a crop. Nutrient pollution (or over-fertilization) causing algae blooms, is an equal threat to the industry. The growing encroachment on the island's wetlands by new housing has destroyed much of the food sources for shellfish. It is the minute protozoa and algae produced by these wetlands that the oyster consumes. The average oyster pumps 50 gallons of water a day through its gills in order to secure its food supply.

The growing population on Long Island has produced sewerage wastes which have polluted many of the potential shellfish farming areas. Of the 549,000 acres of active shellfish production land in and around Long Island's shores, 145,415 acres (26 per cent) are permanently closed to harvesting due to pollution (see Appendix A-6, A-10). Besides contamination, wastes such as duck farm effluents have often caused a nutrient imbalance and a resulting bloom of algae. The studies of the Woods Hole Oceanographic Institute shortly after the end of World War II showed that the over-fertilization of the waters of the Great South Bay by duck farm wastes combined with a peculiar water circulation pattern, caused a bloom of small plankton algae called *Nannochloris* of over 5 million per cubic centimeter of water.[70] This algae bloom was a non-nutrient weed-type growth which crowded out needed nutrients, and resulted in shellfish starvation, and was the chief deterrent of shellfish production in the Bay. At that time, a partial solution to the problem was provided by dredging of Moriches Inlet to improve the circulation pattern and prevent the wastes from flowing westward into Great South Bay. When Moriches Inlet is large enough to flush Moriches Bay, the over-fertilization problem of Great South Bay is lessened.

3. UNDERWATER AND SHORE FRONT PROPERTY PROBLEMS – Long Island is particularly blessed with over 900,000 underwater acres suitable for shellfish farming in its general vicinity. Only 40,000 acres, is presently leasable, and only a small percentage is actively farmed because of the lack of seed oysters. These do not include the spawning beds, where the critical firtilization process takes place. Since one good acre of shellfish producing ground has the capacity to hold 500 bushels of marketable shellfish, this unused land represents a vast untapped natural resource. Leasing of land is essential to encourage scientific farming rather than reliance on natural propagation. In the towns of Islip, Huntington, and Brookhaven, where a balanced farming program between baymen and farmers has been initiated, shellfish cultivation and propagation has been on the upgrade.

The shellfish industry needs adequate shore establishments to support the land-based phase of shellfish farming. These needs include adequate docking facilites for shellfish vessels to both dock and unload, and shore front areas with clean waters for the establishment of shellfish hatcheries. In some cases, the shellfish industry has had to compete with other, nonmarine oriented, industries for clean water locations, forcing it to absorb high overhead costs in terms of land acquisition and taxes.

4. CONTROL OF PREDATORS – In the past years there has been a rise in the population of some of the natural enemies of shellfish. There has been an unprecedented rise in the oyster drill population in Gardiner's Bay, particularly, in all Long Island waters in general. There has also been an influx of a highly prolific and fast growing barnacle in the Gardiner's Bay and Shelter Island areas that sets in early Spring covering and smothering seed oyster crops.



Elimination of starfish.

Finally, there has been a very rapid increase of starfish in Long Island Sound spreading into Huntington and Oyster Bay Harbor. One starfish alone can consume an estimated 200 to 400 seed oysters a year -- and there are probably billions of starfish in Long Island Sound every year.

The use of chemicals, such as lime, and high frequency sound waves for the elimination of these predators have been confined mostly to laboratory experiments. The shellfish industry has helped itself through research and the use of good resource management techniques. However, the industry in its weakened economic state is unable to support the level of basic and applied research necessary to solve these problems. In the meantime, the industry has the continuing obligation to attempt better resource management techniques.

If the problems are solved, it is estimated that the present leasable acreage is capable of producing a crop of oysters valued at 100 million dollars annually.[71]

SAND AND GRAVEL MINING

The sand and gravel industry is the counties' only mining operation and has an annual payroll of about $4,000,000.[72] Although a valuable natural resource, it can be found easily throughout much of the north shore of Long Island. About 90 per cent of the sand and gravel produced comes from upland mining operations. There now exists many zoning controls which prevent the spread of this type of operation, due to the unsightly land scars it leaves behind. The result has been that sand and gravel dredged from bays and harbors has found a profitable market. It should be noted that many of the upland operations were located adjacent to harbors, so that sand and gravel could be transported by barge to New York City. The City is the largest market for this output, due to the construction industry requirements. During 1965 Suffolk County produced 6.5 million tons of sand and gravel and was the largest producer in New York State. Nassau County was second with 4 million tons. Forty to forty-five per cent of the sand and gravel sold to New York City customers was shipped by water.

The existence of restrictive zoning ordinances on upland sites mean that future mining may increasingly turn to dredging operations. These dredging operations can occur in waters up to 30 feet of depth, and are usually accomplished by an endless chain or dipper-type dredge. Since bottom lands are in the public domain, dredging operations for sand are usually part of a town or county public improvement, where the prime purpose is to dig a channel, improve a beach, and/or attempt to improve the circulation of a bay or harbor.

Major controversies have arisen when the public benefit was either negligable or non-existent. The Suffolk County Board of Supervisors, in reponse to a series of newspaper articles on the subject have indicated that they would support a policy of prohibiting the use of the two county dredges to those operations that justify or prove their public benefit.[73] Instead of requiring governmental expenditures for harbor improvements the usual practice is for the township to allow commercial dredging to take place. The town gets the work done and also recovers a royalty for each ton of sand and gravel taken. The improvement of Huntington Harbor would have cost, ordinarily, 2 million dollars. Because the bottom consisted of usable sand and gravel the town was able to sell the privilege of mining this resource and realize a 0.5 million dollars profit.[74]

Usable sand and gravel bottoms exist, primarily, on Long Island's north shore, but it is not entirely clear that dredging of these areas has always been a net gain for society. Controls on dredging often have been sloppy or non-existent, resulting in contractors digging deeper channels than called for; dredging areas not within their contract; or leaving large and irregular "sink holes" on the bottom.

Furthermore, it has been argued that, like other types of dredging, aquatic sand and gravel operations disturb the ecological environment of the bottom. The churning up of the bottom creates a silt which covers the bottom and blocks out sunlight, thus killing off plants by ending photosynthesis. This not only ends the food supply of finfish and shellfish but stops one of their major sources of oxygen -- that which is normally given off during photosynthesis. Furthermore, the decay of the aquatic animals killed off in the process results in the production of noxious gases detrimental to other life forms.

On the other hand, it is argued that the bottom ooze or mud is not nearly of such ecological importance as the wetlands, and since this type of operation does not affect the wetlands, the ecological loss is minor. Furthermore, mining operations redeposit the bottom mud back on the bottom after removing the sand and gravel from it. This mud resettles and new bottom growth should recover it. It is further argued that by improving the flushing action of what may be polluted harbors, the ecological condition of these bays and harbors will be improved rather than destroyed.

In general, the exact ecological effects of dredging operations is not sufficiently understood to prove either argument. However, it is the opinion of the committee that most of the bottom lands dredged to date do not represent "mud" bottoms but, in fact, are hard or sand bottoms that are detrimentally affected by dredging. In addition, the so-called "mud" bottoms are not useless in an ecological sense. They serve the functions of providing a decomposition zone over a photosynthetic one. In other words, the elimination of the decomposition zone alters or destroys the nutrients necessary for the growth of the marshland vegetation.

Duck Farming

Since the 1870's when the first white Pekin ducks were brought in from China, there has been a thriving duck industry on Long Island. Today this industry produces annually 7 to 8 million ducks having a value of 13 to 15 million dollars.[75] The duck industry is located today along the shorefronts and riverfronts of the Towns of Riverhead, Southampton and Brookhaven. This industry provides 1,500 jobs and a 3 million dollar annual payroll. The 45 firms of the duck industry have a total investment value of about 30 million dollars. About 50 per cent of all ducks grown in the United States come from Long Island. The ducklings are hatched in incubators and take two months to grow to a marketable weight of 4-1/2 - 5 pounds. Besides the value of the duck meat, the duck farmer finds a valuable commodity in duck feathers, which bring in about 7 per cent of the total duck farmer revenue.[76]

During their growth stage, the ducks need a constant supply of water in the form of ponds or streams, since this is their natural habitat although some ducks are raised upland. This accounts for the fact that the duck farms are located on some of the most valuable shore front property in the region. Because of this water-based-type agriculture, the streams running through the duck farms carry off duck excrements and pollute the downstream areas. The duck sludge has built up in many areas for so many years that it is now several feet thick and often necessitates costly dredging operations of the streams and bays so affected. The value of the duck industry to the Island is counterbalanced by the resulting cost to the general public in pollution, nuisance, loss of bathing, recreation, fishing, lowering of adjacent real estate values, danger to the public health, and cost of public pollution abatement programs, including dredging.

Because of the failure of local authorities to cope with the problem the State of New York entered the situation in 1949 with legislation directing the abatement of pollution by the duck farms within a period of ten years.[77] A saving clause permitting the pleading of poverty was in-

corporated in the law, however, and combined with a lack of local cooperation and a lack of state enforcement, the result has been continued pollution by the duck farmers.

During the 1950's the state did force the duck farmers to dike their farms so as to separate the ducks from open and public waters. The State Department of Health, in cooperation with the Water Resources Board of Suffolk County, also required that a system of resettlement ponds or lagoons be instituted to filter out the settleable solids before the effluent waters were returned to streams or harbors. This program has been accepted very slowly by the duck farmers, and in many cases the lagoon operation has not been sufficient to prevent duck sludge from continuing to pollute the adjacent waterways.

The duck pollutants do not consist of only solid material but also in bacteria, coliforms and dissolved phosphates and nitrates. These latter have rendered extensive areas of Moriches Bay and Peconic Bay unfit for the harvesting of shellfish, or have lead to a demise in shellfish production in these areas, due to nutrient pollution and the resulting algae growth. The present study simply reconfirms Woods Hole's findings. It seems an almost inescapable conclusion that the nutrients added by the duck farms result in a bloom of small forms *(Nannochloris)*. Studies conducted in the laboratories of the Adelphi Institute of Marine Science show that unpolluted bay water when introduced with "small forms" will not support the growth of additional numbers of "small forms."[78] However, as little as one per cent duck waste added to this water will support a so-called bloom of "small forms."

There has been an $18,000 study (85 per cent financed by Suffolk County) undertaken to study the best method for removing these effluents, and a $25,000 plant is being established to determine the effectiveness of this program.[79] This process involves chlorination of effluents to kill bacteria and coliforms, and the introduction of certain chemicals to coagulate the dissolved matter, as well as aeration to restore the water's oxygen content. This type of operation should be able to remove 90 per cent of the dissolved phosphates and nitrates, but it will not be installed on all of the duck farms until 1968, at least. The cost to the individual duck farmer has been estimated to be $47,000, although 60 per cent of this cost may be financed by state and federal pollution control agencies. This raises serious questions as to whether this program will eliminate the pollution or merely serve as a delay to the solution of the problem since the practicality of this approach has not been established.

Recreation and Tourism

Americans spend more money on recreation than they do on clothing. Recreation stands number four on the list, exceeded only by food, shelter and overall transportation.[80] Swimming is the number two outdoor recreational activity of the American people. Twenty-eight per cent of all Americans over twelve participate in fishing, twenty-three per cent participate in boating, and seven per cent water ski.

The provision of recreational goods and services is an important part of the Long Island economy. The larger part of this business is marine-oriented, and it depends upon the survival of a healthy marine environment for its prosperity. This would include such activities as boat building, sales and services fishing gear and boat rental services, as well as party boat operations; swimming and diving equipment sales; and the rental of housing to people attracted to the Island's shores.

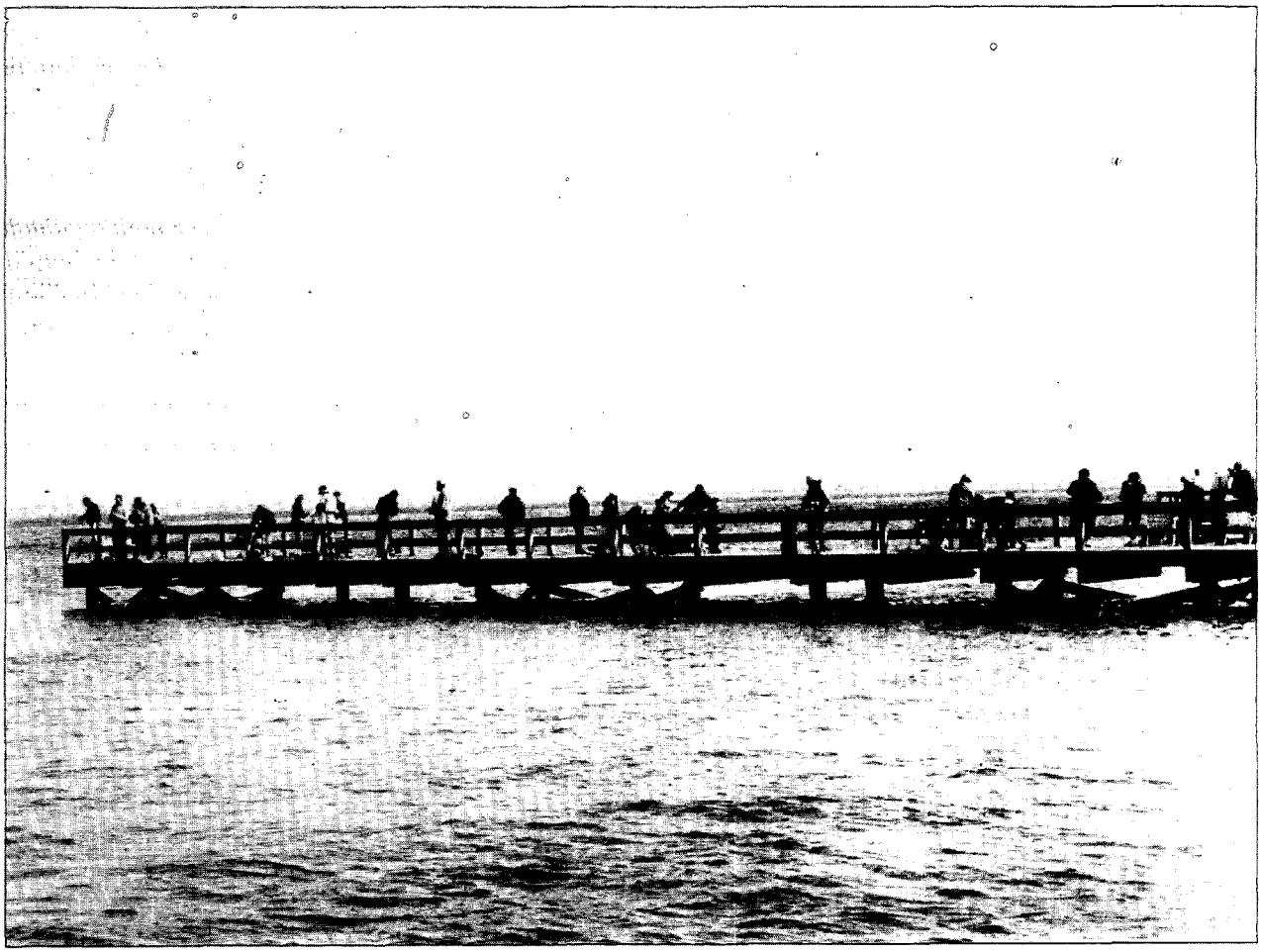
BOATING AND MARINAS - In 1965 it was estimated that there were about 175,000 pleasure boats used in the Nassau-Suffolk Region, including inboard and outboard motor boats and sail

boats. It is estimated that Long Islanders spend an estimated 59 million three hundred thousand dollars per year on boat upkeep, dock rentals, and other operating costs, as well as the purchase of new boats. They consume approximately 12 million gallons of gas each year, which alone accounts for a 3 million six hundred thousand dollar industry. Sales of new boats is an estimated 30 million dollar industry. About 2.3 per cent of the total pleasure boats in the United States can be found on Long Island.[81]

The average marina in the United States does an annual $87,000 average gross. Slip rentals for comparable craft can vary from $5.00 to $70.00 per slip-month, depending upon services offered and location. The average cost is probably in the neighborhood of $1.00 per foot per month -- or $30.00 per month for a 30 foot slip. The boating industry will undoubtedly continue to prosper in the future, due not only to future population growth, but to the growing popularity of sailing and motor boating. Its health depends directly upon the maintenance of relatively clean waters and clean channels. The boating industry is tied to the sport fishing industry, which also depends not only upon clean waters, but water capable also of supporting marine life. Unfortunately, the pleasure boat operators work against themselves when they dump garbage and human excrement into the bays and harbors. The use of shipboard toilets is particularly obnoxious in the shallow waters of Great South Bay, where inadequate flushing by the tides results in concentration of their wastes in the water and upon the bottom. The result is further nutrient and bacterial pollution of these areas.

SPORT FISHING - Sport fishing is a common pastime and recreational outlet for the Island's residents. The sale of fishing tackle, bait, operation of party and charter boats and other fishing activities probably amounts to a 45 million dollar industry for Long Island, conservatively estimated.[82] The continuance of this sport depends largely upon the ecological health of the bays and harbors where the large portion of sport fishing is carried out; and upon the maintenance of navigable channels, particularly in Great South Bay.

Party Boats.



Fishing Pier

Additional facilities such as fishing piers would provide access to many occasional and serious anglers who do not have the means or desire to fish from boats.

OTHER RECREATION - Sales of swimming, diving, and beach equipment is an important business to Long Island, probably producing 2-3 million dollars in annual sales.[83] An even larger business derived from the marine environment is the construction, sale, and rental of seasonal homes. According to the 1960 Census, there were 42,236 seasonal housing units in the region, 33,823 of which were in Suffolk. Since there would be little of this housing if there were no marine environment, we can estimate that these seasonal homes and apartments contribute 50 million dollars to the Island's economy that is directly ascribable to the marine environment, and not elsewhere classified.

TOTAL - The total annual value of the recreation industry attributed to the marine environment, conservatively estimated, can be broken down as follows: (in million dollars)

TABLE I

Boating	$ 59.3
Fishing	45.0
Vacation housing	50.0
Other recreation	2.5
Total	$156.8

Home Building and Real Estate

The marine environment is important to industries which are not directly related to it. The availability of access to harbors and bays can raise property values by substantial increments. The desirability of waterfront property for development often works against the preservation of the marine environment, since it often means the filling in of valuable wetlands. Furthermore, sewage from waterfront homes often seeps directly into the nearby harbor adding to the pollution problem. It is difficult to estimate the total value of waterfront property on Long Island, or the total incremental land costs due to proximity to the water. In San Diego, a house sells for $8,000 more if it is on the waterfront. Apartments in Columbus, Ohio, rent for $15 more per month if they have a view of a 7-1/2 acre "lake" which the builder salvaged from an abandoned sand pit. On Long Island, waterfront plots can command a premium of about $5,000 - $15,000 over non-waterfront lots.[84] It seems likely that if current trends continue, all of the wetlands adjacent to the mainland will be filled and used for home building.

Fortunately, the builders as represented on Long Island by the Long Island Home Builders Institute, have proven to be a progressive industrial group. They have a general awareness of and a desire to preserve certain aesthetic and productive aspects of the marine environment. This may be achieved through the use of sound land planning practices including the concept of cluster zoning to provide access to the waterfront, while at the same time preserving most of the marsh in an open space use. According to Richard D. Schoenfeld, President of the Pickwick Organization, Inc. and an officer of the Institute:

> It is essential that while compatibility between marine environment interests and builder interests could be achieved, it must be remembered that builders are people-oriented as opposed to any other orientation. Popular demand and availability of suitable land to accommodate increased population is the builder's first concern. In no event does the average builder wish to see the marine environment unnecessarily deteriorate or destroyed in any fashion and will work toward the accomplishment of these objectives. However, swimming, boating, visual beauty, and to some extent fishing are perhaps the major aspects which are quickly brought to mind by the average builder's reflection upon the worth of marine environment to his own property. One would imagine that it is not beyond the capability of the Nassau-Suffolk Regional Planning Board and its subcommittee on oceanography to produce hard fact in support of a program to insure the maintenance of a marine environment program in all its aspects, including some which might escape the builder.[85]

A portion of the present conflicts between the real estate and building industries and their impact on the marine environment can be largely attributed to governmental inertia.

The issues of dredging for land-fill with subsequent wetland losses become public, after the private investor has purchased the particular property, conducted engineering studies, and in some cases has begun construction. It is at this stage that governmental action occurs, if at all. The amelioration of conflicts and the wise use of resources requires two-way cooperation. Public agencies should make their policies and programs known in advance. In the case of wetland preservation, the proper units, e.g., counties, towns, should develop conservation plans that include the lands to be saved. This would place the entrepeneurs on notice. Furthermore, land having a definite conservation value should either be acquired by public acquisition of the fee simple, or preserved through modern land development practices, i.e., cluster zoning, density zoning, easements, or the purchase of development rights.

Deep Water Ports

Presently, Suffolk and Nassau Counties receive almost all of their imported goods from a New York City point of access whether shipped by water or land. Some petroleum products come in directly at such points as Port Jefferson, Northville, Inwood and Roslyn. Some general cargo, such as seed potatoes, comes in via Greenport.

Suggestions have been made for the establishment of a major port facility in Suffolk County providing for the movement and handling of general cargo. It must be recognized that such facilities would face competition from the Port of New York, Port of Newark, and Port Elizabeth.[86]

These three ports have extensive and modern facilities and presently operate at less than optimum capacity.

While a general cargo facility can be important to the County's development, consideration should also be given to a port-oriented industrial complex offering choice waterfront industrial sites. Most waterfront land in the nation's seaports must be devoted to actual cargo handling, and due to surrounding urban land uses, the cost of land is too great for it to be utilized for industrial purposes. Yet many industries would be attracted to industrial land offering waterfrontage as a transportation source, and for cooling of industrial processes. Some of these industries are: food processing, chemicals, petroleum refining, glass and stone products, and transportation equipment.[87]

In the future, the construction of a large-scale nuclear desalinization plant which would produce fresh water and electricity, could also enhance the desirability of having waterfront industrial sites in the same area.

Although marine transportation has a very limited potential, the advent of the Fire Island National Sea shore and the anticipated increased volume of visitors will create additional ferry services from the mainland.

Summary of Economic Value

There is an ongoing economic base on Long Island due to the marine environment. The following table is an estimate of its 1965 value:

TABLE II
Total Value of Existing Marine-Oriented Industries, Nassau-Suffolk Region, 1965

(Total value of annual final product estimates, in million dollars)

Recreational Activities	$106.8
Seasonal Housing	50.0
Commercial Fishery: Finfish	3.0
Shellfish	7.0
Duck Farming	14.0
Sand and Gravel	0.4
	$181.2

These marine-oriented businesses generate demands in non-marine businesses. Therefore, their total impact is much greater than outlined here. The continuance and possible increase in the value of these activities depend basically on the quality of the marine environment. Programs of wetland conservation and management; research directed towards the solution of existing problems; pollution elimination; training of workers, technicians, and scientists; will all contribute to human well-being and economic gain. Shellfish alone, under improved conditions can conservatively yield an additional 100 million dollars annually. No attempt has been made to estimate the potential returns from the other existing activities, let alone the return from new industries.

It is clear from the preceding documentation that government, education, and industry working together to meet the common challenge can offer a bright future for Long Island.

CHAPTER B:—
Administrative Agencies and Organizations

There are more than one hundred governmental units that exercise an interest or control over some aspect of the marine environment of Long Island. They range in size and scope from the Congress of the United States to an incorporated village of less than twenty persons.[88] The roles vary from those of an advisory nature to ones of regulatory control. Many of these units also perform operational activities. These interests are diverse and often mutually competitive.[89]

Nassau and Suffolk Counties contain thirteen towns, two cities and numerous villages that have water frontages within their boundaries. Each municipality controls its own destiny in matters of planning and zoning for land use. Therefore, the pattern of development adjacent to and into the marine waters is of local choice. The problems of pollution caused by some of these uses become a state concern and are subject to Health and Conservation Departments' controls. Channel improvements, beach protection and stabilization and other dredging projects must be approved by the Corps of Engineers. As a result of these interrelated activities, the marine environment is subject to control in some degree by each municipality in which the waters are located as well as by the county, state, and federal governments.

At the present time there is no systematic coordination among the various municipalities relative to the marine environment. The resolution of problems, created by one municipality that affect other municipalities, has no regular means of solution other than through the courts. By the same token, effective coordination by the various federal agencies that exert control or influence over the marine environment of Long Island is lacking.

The situation is further complicated by the lack of knowledge of what should be done. No effective program exists to gain an understanding or to solve the mutual problems affecting the total marine environment. It is true that fragmented approaches have been undertaken. However, without having a basis to relate the pieces to the larger problem, many of the efforts amount to little more than groping in the dark.

Coordination is necessary among all the entities of government -- federal, state and local -- to protect, improve and enhance the marine environment.

The lack of initiative on the part of government in general to solve these problems, has resulted in recent years in the formation of numerous citizen groups on Long Island whose main purposes have been to lobby for corrective actions.

Several of the agencies have been discussed earlier in the report under subject headings such as "Conservation", "Dredging", or "Pollution Control". This material will not be repeated except as it bears on its relationships to the activities of other agencies. It must also be stressed that it is not the intent to discuss every existing unit of government or citizen organization. Rather, the purpose is to highlight significant examples that either call for remedial action or set a model to be followed and expanded upon. Three cases have been chosen. The first involves the administrative procedures followed in granting dredging permits. Federal, state, and local agencies, and on occasion private citizens, all participate in the process. The second case describes a single town effort to cope with the management of its marine environment. The third case focuses on two notable instances of citizen action to fill a void in government's exercise of its responsibilities.

Dredging Procedures

In New York State all permits for dredging are

subject to the rules established under Part 332 of the Conservation Law, Part III-A as adopted by the New York State Water Resources Commission.[90]

> Navigable waters -- excavation or fill (1) No person or local public corporation shall excavate from or place fill in the navigable waters of the State unless a permit therefor shall first have been obtained under this Part.[91]

The staff of the New York State Department of Conservation acts as the permit agents for the Commission. In this capacity the local conservation agents receive the applications for dredging, review them in accordance with established standards, and then either grant or deny the request. Provision is made for public hearings, review by the central office, and finally by the Commission itself.

The standards are well-written, and if followed should obviate a current major conflict problem of the marine environment. They read as follows:

> The basis for the issuance of a permit shall be a determination that the proposal is in the public interest in that:
> (a) The proposal is reasonable and necessary.
> (b) The proposal will not cause unreasonable, uncontrolled or unnecessary:
> (1) Erosion of soil from banks or uplands.
> (2) Increased costs of water treatment.
> (3) Loss of crop land and forest by flooding.
> (4) Destruction and failure of natural propagation of fish and aquatic resources.
> (5) Loss of water for beneficial uses and purposes.
> (6) Pollution of affected waters.
> (7) Increase in turbidity.
> (8) Deposition of silt and debris.
> (9) Irregular variations of water velocity.
> (10) Irregular variations in temperature of waters.
> (11) Irregular variations in level of waters.
> (c) The proposal will not endanger the health, safety and welfare of the people of the State of New York.[92]

The only drawback to this legislation is that, unfortunately, it does not apply to Nassau and Suffolk Counties.

> 'Navigable Waters of the State' shall mean all lakes, rivers, streams and waters within the boundaries of the state and not privately owned, which are navigable in fact or upon which vessels are operated, *except* (italics ours) all ridewaters bordering on and lying within the boundaries of Nassau and Suffolk Counties. (Navigation Law, Section 2, Subdivision 4)[93]

Nassau and Suffolk Counties are subject to federal jurisdiction for all activities that create a disturbance affecting navigable waters. The United States Corps of Engineers is the permit agent. It was pointed out in a previous section (see page 14) that the Corps does not address itself to ecological issues in passing upon a dredging permit.

The State of New York assumes an advisory role in these two counties. Permit requests are reviewed by the Conservation agents. Their report is submitted to the New York State Water Resources Commission. On occasion, other state departments, i.e., Health and Commerce also file reports with the Commission on a particular application. The Commission reviews the findings of all reports and files the final report with the Corps. This is entirely an advisory function and appears to be weak procedure.

Coincidental with the State review, the Fish and Wildlife Service -- a division of the Bureau of Sport Fisheries and Wildlife, Region V, of the United States Department of the Interior -- also review these proposed projects and files an advisory report with the Corps. This latter review is required under the provisions of the Federal Coordination Act.

It appears that two courses of action are available to improve the situation. The Corps could adopt similar standards now in existence throughout the balance of the State of New York, or the present laws should be amended to place the waters of Nassau and Suffolk Counties under state jurisdiction.

Town of Hempstead - Conservation and Waterways

On July 23, 1963, the Town Board of the Town of Hempstead adopted a resolution establishing a Department of Conservation and Waterways.[94] This is unique in that Hempstead is the only town in the State of New York with such an agency. Among the responsibilities of the department are:

> a. To promote natural propagation and maintenance of desirable species in ecological balance in the town wetlands and waterways;
>
> b. To promote and maintain sound management practices for such propagation and maintenance in such wetlands and waterways, having regard to ecological factors, the compatibility of production and harvesting of fish and wild life crops with other necessary and desirable land uses, the improvement of fish and wild life resources for recreational purposes, the requirements for public safety and the need for protection against abuse of the privilege of hunting, fishing or trapping;
>
> c. To preserve and maintain the channels, creeks, canals, bays and other waterways of the town in a manner to meet the needs of boatmen, but consistent with sound conservation practices;
>
> d. To promote and maintain areas of town wetlands for public recreation purposes, but consistent with sound conservation practices.[95]

The committee did not assess the level of achievement of this department, since the matter is extraneous to its work. The important factor is that such an agency at the local level does exist. Of note however, is the banning of private dredging permits in public wetland areas as of July 7, 1964. In addition, only two sites at Jones Inlet are permissable dredging areas for the removal of fill necessary for public projects.[96] These sites are considered to be of little wildlife value.

Another point of interest is the fact that the department prepared a management plan, which is reproduced on the following page, outlining the allowable uses in the wetland areas of the town. This is the first such attempt on the Island and can serve as a pilot study for the development of a comprehensive plan for the total marine environment of the two counties.

Citizen Efforts

GREAT SOUTH BAY - Several years ago a citizen's group was organized to combat Robert Moses' proposal to construct a four lane highway on the top of a man-made dune across the length of the Great Barrier Beach (Fire Island). They concluded that the best means to prevent this construction and to retain the unbuilt portions of the Island in a natural state would be to have it placed under the jurisdiction of the National Park Service as a National Seashore.

They were successful in this venture. Congress passed the authorizing legislation creating the Fire Island National Seashore on September 11, 1964.[97]

The leadership of the group soon recognized that the problems of the Great South Bay had an intimate relationship to the Seashore. They also recognized that intergovernmental coordination to solve these problems was lacking. In response a new committee was formed to promote the creation of a "politically-responsible mechanism of intergovernmental cooperation by which the Great South Bay and its wetlands, bay bottoms, estuaries, marine environment and shoreline can be analyzed, planned, regulated and preserved as a unit."[98]

In essence, they call for a Commission to be composed of federal, state and local representatives and private citizens, to treat the bay as a unit. The Commission would initiate a detailed study of the characteristics, uses, economic interests, existing master plans of relevance that would lead to the preparation of "a comprehensive and enforceable master plan for the conservation of the bay resource and its marine environment and shoreline".[99]

Provisions are also included that would grant regulatory powers to the Commission to grant or deny permits for dredging or other disturbance of the Bay during the preparation of the plan.

The latter point, while logical from the citizens' group point of view is not essential to their overall concept. It was pointed out in the previous discussion of dredging that the prevention of undesirable projects -- from a conservation point of view -- could be accomplished by transferring the permit powers from the Corps of Engineers to the New York State Department of Conservation.

MOUNT SINAI HARBOR - Since 1960, several proposals have been put forward by the County and Town of Brookhaven officials for the development of Mount Sinai Harbor. This is apart from the sand and gravel mining operations that are discussed in this report on pages 14 and 15.

In the main, the various schemes called for additional dredging for boating purposes. The attendant conflicting demands between boating, bathing, sports fishing, and conservation interests gave rise to the formation of a citizens' group called "The Advisory Committee for Mount Sinai Harbor". The significance of the Committee's work is that they chose to assume a positive posture. Instead of merely opposing specific projects, they took it upon themselves to prepare a report outlining counter proposals.[100]

They recommended that a balanced and integrated approach be taken to provide for all the needs, without one use detrimentally affecting the others. Their goal was the formulation of a plan whose marine uses would be "compatible with the special character of the area and with one another".[101]

The report contains several specific recommendations designed to meet the diverse needs culminating in a proposed use plan for the Harbor and surrounding properties. They also suggested road and drainage improvements as adjunct topics to the plan.

The merits of their plan are not of consequence to the Oceanographic Committee. A more important lesson can be gathered. In the absence of any governmental planning endeavor, private citizens demonstrated the desire and willingness to work together to support a comprehensive approach to the uses and development of the marine environment.

In conclusion, it is patently clear that an increasing segment of the population is concerned with and willing to work for the enhancement of this valuable resource, and further, that such endeavors are necessary and worthwhile.

Of course, questions can be raised as to the validity of this separate and fragmented approach to the problems that concern the total marine environment. The last section of this report contains a discussion of the Oceanographic Committee's recommendations for solving this enigma.

CHAPTER C:—
Marine Resources Council

Background

The previous chapters mention the current status of the activities, problems and controls relative to the marine environment of Long Island. Several physical and administrative factors or conditions weave through the entire discourse and touch upon each specific topic or activity. The major physical criteria are seen as the condition of the wetlands, the degrees of pollution and dredging practices.

The preservation and wise management of the wetlands is demonstrated to be a vital link to the continuation of commercial fishing, sports fishing, shellfishing, conservation, recreation and tourism.

Pollution in its various forms is proven to be a detrimental force over the same range of activities.

Dredging for the creation of navigable channels and harbors, the production of fill for the building of uplands, or for sand and gravel mining, affects--positively and negatively--all the previously mentioned fields, and the real estate and housing industries.

The major administrative factors include the need for coordinated and directed research, effective enforcement against detrimental practices, and the coordination of governmental functions. The results of the study indicate the need for the establishment of a marine resources council with the purpose of coordinating a continuous regional approach to the management and enhancement of the marine environment.

There are several approaches that can be taken, ranging from an authority with conclusive powers to a citizen's board of an advisory nature, or varying combinations of both types. The balance of this section contains a discussion of one example of a combined type that appears to be best suited to the overall needs. It would be primarily advisory, composed of citizen and governmental members, representative of all interests in the marine environment. The council could also be assigned operational duties such as the initiation and administration of a comprehensive research program.

The form, functions, placement in the governmental structure, staffing and costs of the council constituency are mentioned.

Form of Agency

Form can be defined as structure and/or the conventional way of behaving. The term is used here in the context of the administrative behavior of the organization. The other connotation of form--structure--is discussed in the paragraphs on "constituency."

Most governmental bodies can be classified as being basically regulatory, operational or advisory in form. The emphasis is determined by--and varies according to--their functions, jurisdictions, powers, responsibilities, size, methods of financing, and relationships to other agencies.

The proper management of the marine environment requires all three forms of action. For example, the control of duck farm pollution, sewage discharge and seepage into the marine waters from boats, marinas and land based facilities of any sort, and to a limited extent, the control of pesticides, herbicides and insecticides is or should be regulated by an environmental inspection and control team. Similarly, the dredging and stabilization of inlets and

channels, management of the wetlands, and the construction of parks, marinas, bridges are all operational activities. The formulation of a comprehensive plan for the management of the marine environment and the encouragement of its use is advisory in form.

Regulatory and operational actions are currently being carried out by line agencies with mandated powers, e.g., the U.S. Corps of Engineers, the Nassau and Suffolk County Departments of Health and Public Works. There are instances as cited earlier in this report where the regulatory powers are seen to be insufficient, or inadequately enforced, or in conflict with actions taken by other agencies. This is pertinent to the topic at hand, since it can be suggested that all regulatory powers be vested within one central agency. This would entail the transfer of staff, duties, and statutory mandates from the existing agencies.

The feasibility and desirability of such a move is certainly questionable. Pragmatically speaking, the power structures, vested interests and governmental inertia, represent forces that tend to prevent such implementation. The committee considers this resistance to be valid. Greater efficiency or effectiveness would not necessarily accrue as a result of the transferral of these powers. In fact, the reverse would probably occur.

The specific agencies have the experience, internal rapport and administrative control to improve their performance beyond the level that would be achieved by consolidation. Insufficient powers can be strengthened and inadequate enforcement procedures can be improved within the existing framework of laws and practice.

The necessary ingredient that apparently is not, and probably will not be solved by the independent agencies is the means for dialogue and coordination between them. A forum, where mutual problems may be analyzed, working programs coordinated and resolution of conflicts achieved, is the desirable goal.

Therefore, it is recommended that the proposed council be primarily advisory in form. This recommendation does not necessarily diminish the value of the council, since the initiation and/or support of regulatory actions is not precluded as advisory functions, nor does this discussion preclude the eventual enlargement of the administrative functions to include regulatory activities at such time as they are deemed practical and desirable.

It is also suggested that the assignment to the council of limited operational activities related to the marine environment, not currently within the scope of existing agencies, be considered as proper and desirable.

Functions

The advisory role of governmental agencies is a staff function usually directed towards a specific clientele. This clientele could include the general public--or a segment thereof; a superior officer or agency; line departments; or a combination of the above. Depending on the clientele and the specific nature of the agency, the advisory function could be one of coordination, information or promotion.

The marine resources council is envisioned to serve the entire gamut of clientele by performing the functions of coordination, information and promotion.

COORDINATION - The council would provide the forum for coordinating the actions of governmental line agencies. In this fashion, some of the existing conflicts in programs and duplication of services could be avoided or lessened. In addition, the non-governmental interests could be involved, particularly in cases of conflict between public actions and private opposition.

Another area of coordination involves the field

of education. The council could serve as a catalyst for bringing the various universities, colleges and institutes together to work on those aspects of curriculum, staff, facilities and research programs related to the marine sciences and ocean engineering that are more suited to mutual effort.

INFORMATION - One of the major tasks of the committee during the past fifteen months has been the accumulation, cataloging, distillation and development of information that is pertinent to the issues of the Long Island marine environment. At the present time there is no local central library, data center, or storage and retrieval unit available to service government, industry, education, or the general public on this subject. The files established by the committee represent a very modest beginning. Nevertheless, the requests already received in recent months from all sectors of the community reinforces the belief in the value of expanding the capacity to provide this information.

The council could serve as the clearing house for this information including data on: the literature, research projects, facilities, legislation, educational programs, grants-in-aid, commercial developments and general planning efforts. This service would be particularly beneficial to the county industrial commissions and the private business and technical organizations in their efforts to attract desirable marine-oriented industrial firms to locate in Nassau and Suffolk Counties.

In addition, much of the information already available, and that which will result from future studies, is useful and necessary to the development of a comprehensive plan for the marine environment. The council should work with and guide the existing responsible planning agencies in this direction.

PROMOTION - Dynamic improvements can be made to elevate the status and to maximize the potential of marine activities on the Island. They rest on public support, governmental implementation, and technical and scientific research. The council could hold seminars, publish reports, support proposals for educational programs and otherwise encourage the appreciation on the part of Long Island citizens of the importance of the marine environment.

Public programs for the provision of adequate sewerage systems and water pollution control could be encouraged by the support of the council.

The greatest current need is in the solution of the problems attendant to the local marine environment. It is in this area that the council can perhaps be most useful. The tasks would include: the encouragement of university coordination to specialize in local marine problems; and the encouragement of the establishment of research facilities--national, state, local, foundational and industrial--that will focus on *Long Island's* marine problems. On this base, it would then be possible and feasible to encourage the growth of marine-oriented industries on Long Island.

Placement of Agency

It is recommended that the marine resources council be created by and located within the Nassau-Suffolk Regional Planning Board. This recommendation is based on the following assumptions, reasons and criteria:

1. The previous discussions on the form and functions of the council indicate the comprehensive scope of concern with the total environment of Nassau and Suffolk Counties. Therefore, it is logical to conclude that the jurisdiction of the council must include both counties.
2. The Board's responsibility for the development of a comprehensive plan for the two counties, and the council's interest in the segments of the plan involving the marine environment are closely interrelated.
3. The council should be independent of control from any single interest or bias concerning the activities of the marine environment. Placement

within the Board would ensure this condition.
4. Since the initiative for developing the marine potential, and the powers to guide and control development through planning and zoning are local prerogatives, it is apparent that the council be a creature of local government-rather than of the state or federal government.
5. The Board has the legal ability to create the council in the same fashion that it established the Oceanographic Committee. Therefore, new or additional legislation which often takes time for implementation is not required.
6. There already exists personnel who have worked in this area with the committee, who can serve as the nucleus for staffing.

Constituency and Organization

The membership should reflect a balanced representation of all interests in the marine environment. This requires many participants. In order to establish a managable unit, it is suggested that committees be set up within the council for each broad area of concern. Each committee would be self-operating under the guidance of a chairman and supported by staff, as required. Sub-committees would be formed within each committee for each separate topic of inquiry.

The committee and sub-committee chairman would meet in executive session to coordinate the work of the general membership. The executive committee would be guided by a general chairman.

The following is offered as a suggested method of delineating the committees. Three broad groupings have been developed in the course of this report.

They are:

1. Environmental Protection

2. Education and Research

3. Commercial Aspects

This is a convenient aggregation of interests and the committee recognizes that a good case could be made for other arrangements. It is entirely possible and probable that the adopted organization will differ from this model. For example, topics mentioned as work for sub-committees may be deemed broad enough to warrant full committee status. Nevertheless, this grouping follows the sequence of the study and is flexible enough to include all sub-topics--although there is a great deal of overlapping and mutual concern in the activities of the marine environment. The following paragraph discusses the makeup of each committee.

ENVIRONMENTAL PROTECTION - This committee would be concerned with issues of conservation, wetlands, and pollution control. The membership should include representatives of governmental operating and regulatory agencies, i.e., the United States - Corps of Engineers, Fish and Wildlife Service, and National Park Service; New York State - Department of Conservation, Water Resources Commission and Office for Planning Coordination; Nassau and Suffolk County - Departments of Health, Mosquito Control, Public Works, Planning, Agricultural Extension Services, and sewer authorities; similar existing town and village agencies; and citizen sportsmen and conservation organizations active in these fields. The sub-committees could be limited to conservation, wetlands and pollution control--or additional sub-committees could be set up as seen fit.

EDUCATION AND RESEARCH - This committee would be concerned with inter-university coordination, industrial research, and the guidance of an applied research program.

The inter-university sub-committee would be composed of representatives from each of the universities, colleges and institutes on Long Island and should also have participation from non-Long Island schools that have active marine interests on the Island.

The industrial sub-committee would be composed of firm representatives that have an ongoing marine research program, or indicate a desire to create one. It would also be desirable to invite participation from E.S.S.A.

The guidance of an applied research program could be a sub-committee or full committee responsibility. The research program itself is operational and basically a staff function.

COMMERCIAL ASPECTS - This group would be composed of leaders from all sectors of the business community that have a relationship to the marine environment, including the Nassau and Suffolk County Industrial Commissions and Labor Departments, the Long Island Association and technical societies.

The sub-committee could concentrate on public information and relations, commercial and industrial marine development, and governmental-business liaison.

Staffing

The work of the Oceanographic Committee was aided by staff assigned by the Board. At the very minimum, the Marine Resources Council could operate if secretarial services were assured. However, the real opportunity for progress lies in the undertaking of a unified research program. For this purpose, it is recommended that a high caliber research administrator be employed. This person would require secretarial assistance and perhaps additional professional aid as the program develops.

It is also anticipated that some staff functions could be provided by the Board in the normal course of operations as it did for the past fifteen months.

COSTS - It is recommended that a budget be established within the budget of the Nassau-Suffolk Regional Planning Board for the fiscal year 1967 to provide for the following personnel and expenses:

1 - Research Administrator

1 - Stenographer

1 - Clerk-typist

Office equipment and supplies

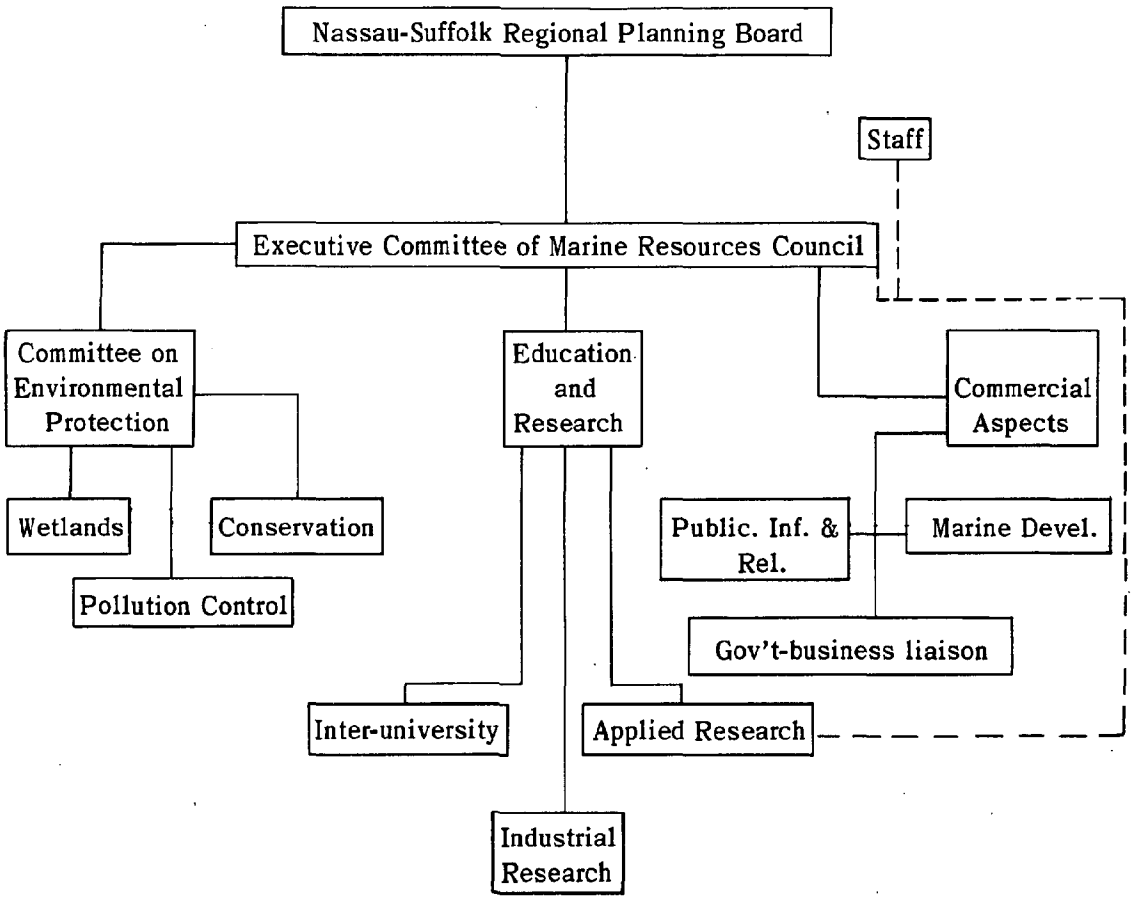
Reports, membership and miscellaneous expenses

The committee estimates that this minimum commitment would amount to approximately 35 thousand dollars.

The following table or organization is a graphic presentation of the discussion.

TABLE III

ORGANIZATION OF THE MARINE RESOURCES COUNCIL



EPILOGUE

IF A MAN HAS A TALENT AND CANNOT USE IT, HE HAS FAILED. IF HE HAS A TALENT AND USES ONLY HALF OF IT, HE HAS PARTLY FAILED. IF HE HAS A TALENT AND LEARNS SOMEHOW TO USE THE WHOLE OF IT, HE HAS GLORIOUSLY SUCCEEDED, AND WON A SATISFACTION AND A TRIUMPH FEW MEN EVER KNOW.

THOMAS WOLFE
"The Web and The Rock"

The unique talent, or gift, of Long Island is its marine environment. Few communities have been endowed with such a handsome but delicate gift. The marine environment is a control on the attractiveness and health of the Island. Well managed, it will continue to serve as Long Island's greatest asset. Unmanaged or mismanaged, it will become a costly and dangerous liability.

Notes

CHAPTER A:
— Discussion of the Problem

Section 1 — Background

PAGE

1. William A. Ritchie, *The Archaeology of New York State* (Garden City, N.Y., The Natural History Press, 1965). pp. 141, 163-169, 265-271. Jacqueline Overton, *Indian Life on Long Island* (Port Washington, N.Y., Ira J. Friedman, Inc., 1963). 3-1
2. Rufus Langhans, *Nesaquake Tales* (Smithtown, N.Y., The Smithtown Library, 1965), and *Places and Names*, 1961. 3-1
3. "Island Fishermen: A Handful of Us Left," *The Long Island Catholic* (April 23, 1964). Senator Claiborne Pell, *Challenge of the Seven Seas*, (New York, N.Y., William Morrow & Co., 1966). p. 102. 3-1
4. *Yearbook of Fishery Statistics*, Food and Agriculture Organization of the United Nations, (New York, N.Y.) vol. 18. 3-1
5. The federal expenditures for oceanographic programs have grown from 8 million dollars in 1953 to over 300 million dollars at the present time. Similarly, private industry has invested almost 3 billion dollars in continental shelf exploration in the past decade. See the Report of the Panel on Oceanography, President's Science Advisory Committee, *Effective Use of the Sea* (Washington, D.C., The White House, June, 1966). pp. 66-75. 3-1
6. Suffolk County Department of Planning, *Economic Base* (Hauppauge, N.Y. The Department, May, 1962). Nassau County Planning Commission, *Selected Population and Employment Data* (Mineola, N.Y., The Commission, 1965). 3-2
7. Suffolk County Department of Planning, *op. cit.* Arthur D. Little, Inc., *An Industrial Development Study of Suffolk County.* (September, 1965). 3-2
8. These groups are discussed at length in Chapter B, p. 39. 3-2
9. See Appendix A-1. 3-2
10. The following men were appointed: Rear Adm. E.C. Stephan, USN (ret.), Dr. Clarke Williams, Mr. Leo Geyer, Mr. George Vanderborgh, Dr. Edwin P. Creaser, Sr., Mr. Harold Gleason and Dr. Mark E. Frey. 3-2
11. This statement of objectives was ratified by the Nassau-Suffolk Regional Planning Board on September 27, 1965. 3-2
12. See Appendix, A-2. 3-2
13. Nussbaumer, Clarke and Velsey, *Summary of Drainage Report-Suffolk County, N.Y.* (New York, N.Y., July, 1957). This report dicusses the general topography as related to drainage. See also the United States Coast and Geodetic Survey's Quadrangle Maps for Long Island of 1954. 3-3
14. Lee E. Koppelman, *Planning For Open Space in Suffolk County* (Hauppauge, N.Y., Suffolk County Dept. of Planning, May 1964). p. 6. 3-3
15. Col. Thomas H. Wiggin, *Report on A Comprehensive Plan for the Development and Distribution of the Available Water Supply of Suffolk County, Long Island, N.Y.* (Suffolk County, New York, Suffolk County Water Authority, January, 1957). p. 24. 3-4

Section 2 — Conservation

16. Mr. Anthony Taormina, of the New York State Department of Conservation, rendered such testimony before the Committee on Oct. 20, 1965. 3-5

17. Eugene P. Odum, "The Role of Tidal Marshes in Estuarine Production" *The Conservationist* (New York State Dept. of Conservation, June-July, 1961), pp. 12-15. 3-5
18. Report of the Environmental Pollution Panel - President's Science Advisory Committee, *Restoring the Quality of Our Environment,* (The White House, November, 1965). p. 222. 3-5
19. *Effective Use of the Sea,* p. 17. 3-5
20. U.S. Fish and Wildlife Service, *Review Draft of Shellfish Resources* (New York, August 7, 1962). 3-5
21. N.Y.S. Dept. of Conservation, *Mt. Sinai Harbor,* p. 7. 3-5
22. Mr. Anthony Taormina, *loc. cit.* 3-7
23. Mr. David H. Wallace, of the New York State Department of Conservation, in testimony on September 22, 1965. Mr. George Vanderborgh, president, Long Island Shellfish Farmers, in testimony on November 15, 1965. 3-8
24. *Restoring the Quality of Our Environment,* p. 22. 3-8
25. This estimate is based on various testimony presented to the Committee and includes the materials removed by the Long Island State Park Commission for its various park programs. 3-8
26. Testimony of Mr. Edward Leitiet and Mr. George Murphy of the U.S. Dredging Corp., April 20, 1966. 3-8
27. Mr. George Vanderborgh, *loc. cit.* 3-8
28. Mr. Anthony Taormina, *loc. cit.* 3-9
29. See Suffolk County Appropriations Bill No. 223, March 28, 1966. 3-9
30. Dredging Ordinance of the Town of Babylon, November 26, 1957. 3-9
31. Mr. David H. Wallace, *loc. cit.* 3-10
32. Maxwell C. Wheat, Jr. "Eelgrass - A Controversial Link in the Chain of Life in our Marine Waters" *The Conservationist* (New York State Dept. of Conservation, February-March, 1962) pp. 28-30. 3-10
33. Ronald S. Wilson and A. Harry Brenowitz, *A Report on the Ecology of Great South Bay and Adjacent Waters,* (Institute of Marine Science, Adelphi University, Oakdale, N.Y., 1966). 3-10
34. *Ibid.* pp. 24-25 3-11

Section 3 — Pollution

35. *Effective Use of the Sea,* p. xi. 3-12
36. Testimony of Mr. Jack Flynn, P.E., Principal Sanitary Environment Engineer of the Suffolk County Dept. of Health, Nov. 15, 1965. 3-12
37. *Ibid.* 3-12
38. County of Suffolk, N.Y., *Report on Need and Feasibility for Public Sewerage Disposal Facilities in Western Suffolk* (Hauppauge and Riverhead, N.Y., January, 1962) Appendix B. 3-12
39. Resolution No. 494-1965 of the Board of Supervisors of Suffolk County, New York, Sept. 27, 1965, establishing the Suffolk County Sewer Agency, and for other purposes. 3-13
40. *Restoring the Quality of Our Environment.* pp. 223-224. 3-13
41. Woods Hole Oceanographic Institute, *Report on a Survey of the Hydrography of Great South Bay made during the summer of 1950 for the Town of Islip, N.Y.* (Woods Hole, Mass., Jan., 1951). 3-13
42. Testimony of Mr. Kinsey of the Nassau County Department of Parks, Mosquito Control Division, April 13, 1966. 3-14
43. Woods Hole Oceanographic Institute, *Report on a Survey on the Chemistry and Hydrography of Great South Bay and Moriches Bay made in June, 1957 for the Town of Islip, N.Y.* (Woods Hole, Mass., Oct, 1957). p. 4. 3-15
44. Woods Hole Oceanographic Institute, *Report...of 1950...*pp. ii-iii 3-15

Section 4 — Education

45. The basic list was taken from the report, *Oceanography in New York*, by Dr. John H. Ryther of the Woods Hole Oceanographic Institute. The individual schools were asked to update the information if necessary. Four schools responded. 3-17
46. *Ibid.* 3-18
47. *Ibid.* p. 37. 3-18
48. *Nassau County Marine Environment Center - Feasibility and Recommendations*, Museum of Natural History, Division of Recreation and Parks, Department of Public Works, June, 1966. (mimeo). 3-19
49. Speech at the meeting of the American Fisheries Society in September, 1963 and quoted in *Science*, September 4, 1964. 3-20
50. Dr. Athleston F. Spilhaus, *et. al. Science* vol. 15, (June, 1966) p. 1359. 3-20

Section 5 — Industrial Research

51. *Effective Use of the Sea*, p. 80. 3-24
52. Statement by Captain Everett Snyder, U.S.N. and Mr. Robert Abel at Heritage Motel, Syosset, N.Y., August 24, 1966. 3-25
53. *Nassau County Marine Environment Center - Feasibility and Recommendations*, as cited above, also Ralph G. Caso and Francis Purcell, "Testimony before the House Merchant Marine and Fisheries Subcommittee on Fish and Wildlife Conservation on H.R. 11236" (Town of Hempstead, N.Y., June 21, 1966). 3-25
54. The Suffolk County Board of Supervisors has set aside a portion of the park at Cedar Beach Point in the Town of Southold for experimental research on shellfish. 3-25
55. Master Plan of the State University of New York at Stony Brook. 3-25
56. Testimony of David H. Wallace, N.Y. State Dept. of Conservation, before the Committee, Sept. 15, 1966. See also the N.Y. State Capital Construction Budget for F.Y. '66-'67. This project is receiving 75% federal financing under P.L. 88-309. 3-25
57. The Land Acquisition Bond Act of 1960, provided for the allocation of 75 million dollars to be spent by local municipalities and the State for the purchase of open-space areas for conservation and recreation. See Article 16-C Park and Recreation Land Acquistion Act, Section 875-85. 3-25
58. New York State Conservation Law as amended, Article V, Part V-A, (1963), "Comprehensive Public Water Supply Studies and Reports." 3-25
59. "Harbor Bill Passes" *Newsday*, September 3, 1966. 3-25
60. Evert Clark, "Ocean Institute is Formed by U.S." *New York Times*, December 26, 1966, p. 72. 3-25
61. *Effective Use of the Sea*, p. 100. 3-26
62. *Ibid.* 3-26

Section 6 — Economic Aspects

63. Testimony of Harry H. Raines and representatives of the Greenport Sea Food Products Co. 3-27

64. Senator Claiborne Pell with Harold Leland Goodwin, *Challenge of the Seven Seas*, (William Morrow & Co., New York, 1966) pp. 65-67. 3-27
65. As cited by Mr. Cornelius Poillon, President, Long Island Fishermen's Assoc. in testimony before the Committee on October 10, 1965. 3-28
66. Senator Claiborne Pell, *op cit.*, pp. 1-24. 3-28
67. *Ibid.*, p. 6. The Committee wishes to acknowledge its appreciation to the publishers, William Morrow & Co., Inc. for their generous cooperation in permitting this quote to be used. 3-28
68. "Underwater Farming Long Island's Oldest Industry and Newest Business Frontier" *Long Island Commercial Review*, Special Section (November 21, 1963), also testimony of D. Wallace and G. Vanderborgh, Jr. before the Committee, September 15 and September 22, 1965. 3-29
69. *Ibid.* 3-29
70. Woods Hole, "Report...of June, 1957...", p. 8. 3-30
71. Testimony of George Vanderborgh, Jr., President, Long Island Shellfish Farmers, before the Committee, September 15, 1965. 3-32
72. Testimony of Mr. Edward Leitiet and Mr. James Murphy representing U.S. Dredging Corp., before the Committee, April 20, 1966. 3-32
73. *Ibid.* 3-32
74. *Ibid.* 3-32
75. Testimony of the Long Island Duck Farmers Cooperative, Inc. before the Committee, December 15, 1965. The total investment in land,buildings and equipment, including processing plants, totals 16.4 million dollars. 3-33
76. *Ibid.* This amounts to 1.2 million dollars. 3-33
77. New York State Water Pollution Control Law of 1949 (now Section 112 of the New York State Public Health Law). 3-33
78. Wilson and Brenowitz, *op. cit.* p. 24. 3-34
79. For a history of this pilot plant and the relevant legislation, see "A Study of the Pollution Control Effects in Suffolk County, New York, as it Pertains to the Long Island Duck Industry." (Long Island Duck Farmers Cooperative, Inc., Eastport, New York, 1965, mimeo) pp. 4-13. 3-34
80. Estimates were made on the basis of data obtained from the State of New York and from William B. Rick, *Planning and Developing Waterfront Property*, (Technical Bulletin 49, Urban Land Institute, Washington, D. C.). p.8. 3-34
81. Estimate based on statistics supplied by the New York State Dept. of Licenses and information supplied by the National Home Builders Institute. 3-35
82. Estimate based on testimony of Cornelius Poillon and others. 3-35
83. Estimate based on testimony of Joseph Dutra, Herbert Bellringer and others. 3-36
84. Taken from material submitted by Richard Schoenfeld from the National Home Builders Institute, Washington, D.C. 3-37
85. Richard Schoenfeld, Letter to Lee E. Koppelman, May 13, 1966 and testimony before the Committee, April 27, 1966. 3-37
86. Arthur D. Little, Inc. *An Industrial Development Program for Suffolk County*, Report to the Suffolk County Department of Commerce and Industry, p. 70. A full discussion of the locational requirements and advantages for port-oriented operations is contained in Benjamin Chinitz, *Freight and the Metropolis* (Harvard University Press, Cambridge, Mass. 1960). 3-38
87. Arthur D. Little, Inc. *op. cit.* pp. C-1 to C-25. 3-38

CHAPTER B:
— Administrative Agencies and Organizations

88. The population of the Incorporated Village of Dering Harbor in the Town of Shelter Island in 1960 was 19 persons according to the Bureau of the Census. 3-39
89. See discussion on pages 3-6 to 3-9. 3-39
90. Part 332, Conservation Law of the State of New York, Part III-A Laws of 1965, Chapter 955, adopted by the N.Y. State Water Resources Commission on December 2, 1965. 3-40
91. *Ibid.*, Section 322.2 (b) - 1. 3-40
92. *Ibid.*, Section 332.6. 3-40
93. *Ibid.*, Section 322.1 - (e). 3-40
94. Case No. 9733 Resolution No. 1327-1963. 3-41
95. *Ibid.*, Resolution No. 1327-1963. 3-41
96. Department of Conservation and Waterways, *The Hempstead Town Conservationist,* Vol. 1 (Hempstead, N.Y., Winter, 1966), p. 4. 3-41
97. Public Law 88-587 (88th Congress) "An Act to Establish the Fire Island National Seashore and for other Purposes." 3-41
98. Excerpt from a draft of a proposed bill to be submitted to the New York State Legislature for the creation of a Great South Bay Conservation Commission, sent to Lee E. Koppelman by Mr. Irving Like, on September 8,1966. 3-41
99. *Ibid,*, p. 2. 3-42
100. "A Proposal to the Town of Brookhaven for the Development of Mount Sinai Harbor," September 23, 1966, (mimeo). 3-42
101. *Ibid.*, p. 1. 3-42

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PART IV
APPENDICES

At a regular meeting of the NASSAU-SUFFOLK REGIONAL PLANNING BOARD held on April 26, 1965, the following resolution was unanimously adopted:

RESOLUTION

Re: OCEANOGRAPHIC COMMITTEE

WHEREAS, it is in the interest of the people of Nassau and Suffolk Counties to plan for industrial growth, and

WHEREAS, the field of oceanography has tremendous growth potential, and

WHEREAS, the natural resources of Nassau and Suffolk Counties are of prime value in this field, Be It Therefore

RESOLVED, That the Nassau-Suffolk Regional Planning Board create a special committee to be comprised of persons from the field of government, finance, industry and education for the purpose of investigation and recommendations for the implementation of oceanographic projects in Nassau and Suffolk Counties.

HEARINGS

September 9, 1965	Joint Dinner Meeting
September 15, 1965	Mr. Lee E. Koppelman Planning
	Mr. George Vanderborgh, Jr. Sea Farming
	Mr. Leo A. Geyer Current Industrial Participation on Ocean Engineering
	Dr. Edwin P. Creaser Current Educational Efforts in Oceanography
	Dr. Mark E. Frey Potential Programs for Long Island
September 22, 1965	Mr. David H. Wallace History and Potential of the Oyster Industry
October 6, 1965	Mr. Jay Verme Mr. Richard Deane
October 13, 1965	Mr. Cornelius Poillon Mr. Lawrence I. Clarke
October 20, 1965	Mr. Anthony Taormina Wetlands and the conservation aspects related to marine organisms
October 25, 1965	Mr. James S. Lunn
November 3, 1965	Mr. Pearsall Mr. William Paulsen Mr. Harry Kilthau

November 15, 1965	Mr. George Vanderborgh, Mr. Anthony Taormina and Mr. John Suydam Summary reports
November 15, 1965	Mr. Jack Flynn Pollution of marine resources
November 23, 1965	Special Meeting Shellfish Laboratory
December 1, 1965	General Work Session
December 15, 1965	Mr. Nelson Houck Mr. Alden Young Mr. W.D. Urban Mr. Devenpeck (Representatives of duck industry)
January 19, 1966	Mr. George Semerjian Sand and Gravel Mining
February 9, 1966	General Work Session
February 16, 1966	General Work Session
March 9, 1966	Harry H. Rains, Esq. Greenport Seafood Products, Inc.
March 16, 1966	General Work Session
March 23, 1966	Mr. Maurice Barbash
March 30, 1966	Mr. Leo A. Geyer Dr. Mark E. Frey
April 6, 1966	General Work Session

April 13, 1966	Mr. Edward Patterson Mr. Kinsey Nassau County Departments of Parks and Mosquito Control
April 20, 1966	Mr. Edward Leitiet Mr. Murphy
April 27, 1966	Mr. Richard D. Schoenfeld
May 4, 1966	Mr. Joseph F. Dutra, Jr.
May 11, 1966	Dr. Robert Cushman Murphy
May 18, 1966	Mr. Herbert H. Bellringer
May 25, 1966	Dr. Bentley Glass
July 6, 1966	Dr. John H. Ryther
September 22, 1966	General Work Session
September 28, 1966	General Work Session
October 5, 1966	General Work Session
October 12, 1966	Meeting with representatives of Long Island's colleges and universities Dr. Bentley Glass University of the State of New York at Stony Brook Dr. J.D. Barton, Jr. Southampton College Dr. Louis Pyenson University of the State of New York at Farmingdale Dean Geoffrey Charlesworth Hofstra University Mr. Thomas Haresign Southampton College

	Prof. Charles Rockwell Nassau Community College
	Prof. William Hershcopf Nassau Community College
	Dr. Robert Z. Brown Adelphi College - Suffolk
	Mr. George Edward Beatty Molloy College
	Prof. Walter L. Smith Suffolk Community College
	Dr. Allan B. Burdick Adelphi University
October 12, 1966	Dr. Charles F. Powers University of Michigan
	Dr. Hugo Freudenthal Long Island University
October 19, 1966	General Work Session
October 26, 1966	General Work Session
November 2, 1966	General Work Session
November 9, 1966	General Work Session
November 16, 1966	General Work Session
December 7, 1966	Joint meeting with Nassau-Suffolk Regional Planning Board

SHELLFISH AREAS

New York

I. INTERSTATE AREAS - 409,785 Acres

A. Active shellfish production areas

1. Total of such areas: Approximately 38,000 acres
2. Areas fully approved:

Area	Acres	Location
Long Island Sound	13,500	N.Y. - Connecticut State Line

3. Areas conditionally approved: None
4. Areas closed to harvesting by pollution
   a. Full year:

Area	Acres	Location	Pollution Source
Long Island Sound	7,500	N.Y. - Connecticut State Line	Municipal Wastes
Raritan Bay	17,000	N.Y. - New Jersey State Line	Municipal Wastes

Approximately 24,500 acres of active shellfish production areas are closed to harvesting by pollution.

   b. Part of year: None

B. Inactive shellfish areas:

1. Total of such areas: 371,785 acres
2. Areas fully approved: 356,635 acres
3. Areas conditionally approved: None
4. Areas closed by pollution: 15,150 acres

C. Areas closed due to presence of marine toxin: None

II. INTRASTATE AREAS

A. Active shellfish production areas

1. Total of such areas: 511,000 acres

2. Areas fully approved:

Area	Acres	Location
NASSAU COUNTY		
Hempstead Harbor	1,150	North Shore - Long Island
Dosoris Pond	160	North Shore - Long Island
Bayville Harbor	320	North Shore - Long Island
Oyster Bay Harbor	1,650	North Shore - Long Island
Oyster Bay	2,700	North Shore - Long Island
Cold Spring Harbor	1,090	North Shore - Long Island
Hempstead Bay	11,800	South Shore - Long Island
South Oyster Bay	4,700	South Shore - Long Island
Zach's Bay	210	South Shore - Long Island
SUFFOLK COUNTY		
Cold Spring Harbor	1,025	North Shore - Long Island
Lloyd Harbor	685	North Shore - Long Island
Huntington Harbor	490	North Shore - Long Island
Huntington Bay	3,850	North Shore - Long Island
Centerport Harbor	480	North Shore - Long Island
Northport Bay	2,510	North Shore - Long Island
Duck Island Harbor	275	North Shore - Long Island
Smithtown Bay	10,540	North Shore - Long Island
Stony Brook Harbor	940	North Shore - Long Island
Conscience Bay	290	North Shore - Long Island
Setauket Harbor	60	North Shore - Long Island
Port Jefferson Harbor	600	North Shore - Long Island
Mt. Sinai Harbor	390	North Shore - Long Island
Mattituck Inlet	235	North Shore at eastern end of Long Island
Goldsmith's Inlet	15	North Shore at eastern end of Long Island
Great Peconic Bay	19,700	Between North and South Shores at eastern end of L.I.
Cold Spring Pond	225	Southern Shore of Great Peconic Bay
Sebonac Creek	480	Southern Shore of Great Peconic Bay
Cutchogue Harbor	470	Between Great Peconic Bay and Little Peconic Bay - eastern L.I.
Little Peconic Bay	13,995	Between North and South Shores at eastern end of L.I.

Area	Acres	Location
North Sea Harbor	190	Southern Shore of Little Peconic Bay
Noyack Bay	3,960	Southwest of Shelter Island
Southold Bay	1,210	West of Shelter Island
Hashamomuck Pond	190	Northwest of Shelter Island
Pipes Cove	380	Northwest of Shelter Island
Greenport Harbor	300	Northwest of Shelter Island
Shelter Island Sound	11,085	Southwest of Shelter Island
West Neck Harbor	460	Southern Shore of Shelter Island
Dering Harbor	205	Northern Shore of Shelter Island
Coecles Harbor	1,250	Eastern Shore of Shelter Island
Sag Harbor	1,170	South of Shelter Island
Northwest Harbor	1,530	Southeast of Shelter Island
Orient Harbor	2,410	North of Shelter Island
Long Beach Bay	605	Northeast of Shelter Island
Gardiners Bay	48,875	Eastern end of Long Island
Threemile Harbor	1,110	South of Gardiners Bay
Acabonac Harbor	485	Southwest of Gardiners Island
Napeague Bay	10,895	Southeast of Gardiners Island
Fort Pond Bay	1,510	Southeast of Gardiners Island
Montauk Harbor	1,250	Eastern tip of Long Island
Block Island Sound	125,700	Off the eastern tip of Long Island
Fishers Island Sound	6,840	Fishers Island
Mecox Bay	1,150	South Shore - Long Island
Shinnecock Bay	9,450	South Shore - Long Island
Quantuck Bay	400	South Shore - Long Island
Moriches Bay	6,230	South Shore - Long Island
Bellport Bay	3,520	South Shore - Long Island
Great South Bay	65,770	South Shore - Long Island
Approximately	390,155	Acres of active shellfish production areas fully approved

3. Areas conditionally approved: None

4. Areas closed to harvesting by pollution
   a. Full year

Area	Acres	Location	Pollution Source
NASSAU COUNTY			
Little Neck Bay	675	North Shore - Long Island	Municipal Wastes
Manhasset Bay	2,540	North Shore - Long Island	Municipal Wastes
Hempstead Harbor	3,480	North Shore - Long Island	Municipal Wastes
Oyster Bay Harbor	200	North Shore - Long Island	Municipal Wastes
Jamaica Bay	540	South Shore - Long Island	Municipal Wastes
Hempstead Bay	2,265	South Shore - Long Island	Municipal Wastes
South Oyster Bay	375	South Shore - Long Island	Municipal Wastes
SUFFOLK COUNTY			
Huntington Harbor	95	North Shore - Long Island	Municipal Wastes
Northport Bay	245	North Shore - Long Island	Municipal Wastes
Nissequogue River	570	North Shore - Long Island	Municipal Wastes
Smithtown Bay	100	North Shore - Long Island	Municipal Wastes
Port Jefferson Harbor	580	North Shore - Long Island	Municipal Wastes
Mattituck Inlet	4	North Shore - Long Island	Municipal Wastes
Peconic River	585	Between North and South Shore of L.I. at eastern end	Municipal Wastes
Flanders and Reeves Bay	2,540	West of Great Peconic Bay	Municipal Wastes and Duck Farm Wastes
Cutchogue Harbor	2	Between Great Peconic Bay and Little Peconic Bay	Municipal Wastes and Duck Farm Wastes
Greenport Harbor	170	Northwest of Shelter Island	Municipal Wastes and Duck Farm Wastes
Shelter Island Sound	90	Southwest of Shelter Island	Municipal Wastes and Duck Farm Wastes
Sag Harbor	320	South of Shelter Island	Municipal Wastes and Duck Farm Wastes

Area	Acres	Location	Pollution Sources
Mecox Bay	90	South Shore - Long Island	Municipal Wastes and Duck Farm Wastes
Shinnecock Bay	350	South Shore - Long Island	Municipal Wastes and Duck Farm Wastes
Quantuck Bay	150	South Shore - Long Island	Municipal Wastes and Duck Farm Wastes
Moriches Bay	2,285	South Shore - Long Island	Municipal Wastes and Duck Farm Wastes
Bellport Bay	320	South Shore - Long Island	Municipal Wastes
Great South Bay	5,345	South Shore - Long Island	Municipal Wastes
Approximately	120,916	Acres of active shellfish production areas closed full year due to pollution	

b. Part of year:

Area	Acres	Location	Pollution Source
SUFFOLK COUNTY			
Moriches Bay	8,900	South Shore - Long Island	Municipal and Duck Farm Wastes

B. Inactive Shellfish Areas:
1. Total of such areas: 60,320 acres
2. Areas fully approved: 60,000 acres
3. Areas closed by pollution: 320 acres

C. Areas closed due to the presence of marine toxins: None

Source: New York State Department of Health

LONG ISLAND LANDINGS
BY AREA OF CATCH
1965

Area	Pounds of Fish	Pounds of Shellfish
Ocean, New Jersey Boundary to East Rockaway	4,759,862	350,862
Ocean, East Rockaway Inlet to Jones Inlet	933,200	699,821
Ocean, Jones Inlet to Moriches Inlet	2,183,261	1,009,716
Great South Bay	144,773	4,325,176
Ocean, Moriches Inlet to Shinnecock Inlet	1,775,116	275,835
Moriches and Shinnecock Bays	253,400	574,882
Ocean, Shinnecock Inlet to Montauk, including Block Island Sound	3,743,875	92,103
Gardiners, Peconic and Adjoining Bays	3,371,111	1,636,969
Long Island Sound	672,435	1,218,845
Unclassified	29,990,300	1,218,845
Ocean, Outside 3 mile limit	4,744,960	620,534
Total	52,572,293	10,804,893

Source: New York State Conservation Department

COMMERCIAL FISH AND SHELLFISH LANDING FROM LONG ISLAND WATERS, PRINCIPAL SPECIES

(Including fish landed in New York City)

Species	Pounds			Value
	1958	1963	1965	1965
Fish:				
Bluefish	115,465	696,750	1,036,366	$ 156,817
Butterfish	3,039,730	1,151,041	765,655	89,407
Cod	2,200,363	882,200	365,931	53,239
Eels	263,690	201,950	269,100	39,010
Flounders	2,533,107	6,520,800	5,937,806	383,225
Fluke	2,341,236	1,305,865	2,451,552	557,042
Hake	601,635	646,805	668,433	21,085
Herring, Sea	295,870	87,050	277,320	5,828
Mackerel	157,838	78,820	90,938	12,500
Menhaden	55,298,950	91,650,540	30,139,635	417,407
Scup or Porgy	14,319,291	9,307,715	7,536,888	746,701
Sea Bass	841,608	576,360	381,611	84,467
Sea Trout (Weak Fish)	87,500	85,820	72,963	13,788
Shad	211,000	69,400	13,312	1,609
Spearing	140,300	165,200	144,962	20,500
Striped Bass	320,815	626,100	702,935	135,831
Swellfish	230,300	947,700	402,492	20,754
Swordfish	84,000	46,860	87,665	29,731
Tilefish	88,622	27,935	44,900	4,664
Whiting	2,020,045	2,367,660	3,337,645	160,522
Whiteperch	21,100	20,600	33,350	5,205
All Other	1,802,403	322,480	659,974	51,798
Total	87,014,868	118,285,651	55,421,433	$ 3,011,130
Shellfish:				
Lobsters, northern	357,362	380,055	648,571	$ 446,277
Clams: hard	3,736,956	5,311,032	5,947,632	5,149,573
soft and others	643,656	1,081,328	1,716,137	194,849
Oysters	1,056,725	394,468	199,336	322,471
Scallops: Bay	594,039	302,374	886,043	721,497
Sea	2,018,697	1,924,371	2,917,153	1,898,374
Squid	1,231,560	872,120	974,063	66,009
Other Shellfish	420,507	96,660	338,210	54,482
Total	9,702,140	10,362,408	13,627,145	$ 8,853,532
Grand Total	96,717,008	128,648,059	69,048,578	$11,864,662

Source: New York State Conservation Department

COMMERCIAL FISH AND SHELLFISH LANDINGS
FROM LONG ISLAND WATERS, 1954 to 1965

	Finfish		Shellfish		Total All Species	
	Thous. Lbs.	Thous. Dollars	Thous. Lbs.	Thous. Dollars	Thous. Lbs.	Thous. Dollars
1954	125,878.0	$3,430.3	10,877.5	$4,121.4	136,755.6	$ 7,551.7
1955	120,208.5	3,357.0	11,994.6	5,530.6	132,203.1	8,887.7
1956	141,451.1	3,633.9	11,213.5	5,161.4	152,664.7	8,795.4
1957	146,751.0	3,708.7	10,242.0	4,748.4	156,993.0	8,457.1
1958	87,014.9	3,315.4	9,702.1	4,522.5	95,938.5	7,837.9
1959	104,628.8	3,551.7	9,810.7	5,254.7	114,439.5	8,806.5
1960	115,439.2	3,407.1	10,793.3	5,332.6	126,232.5	8,739.7
1961	112,125.3	3,471.3	11,490.4	5,659.6	123,615.8	9,130.9
1962	165,720.5	3,645.3	12,035.2	6,184.7	177,755.7	9,830.0
1963	118,285.6	3,499.8	10,362.4	5,754.5	128,648.0	9,254.3
1964	67,686.3	3,017.0	11,471.3	6,866.9	79,157.6	9,884.0
1965	55,421.4	3,011.1	13,627.1	8,853.5	69,048.5	11,864.6

Source: New York State Conservation Department